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NAS KEY WEST
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CONTAMINATION ASSESSMENT REPORT FOR HAMACA HAWK MISSILE SITE NAS KEY
WEST FL
8/1/1997
BLASLAND, BOUCK AND LEE

0095

REPORT

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Susan Collins

Contamination Assessment Report

Hamaca Hawk Missile Site

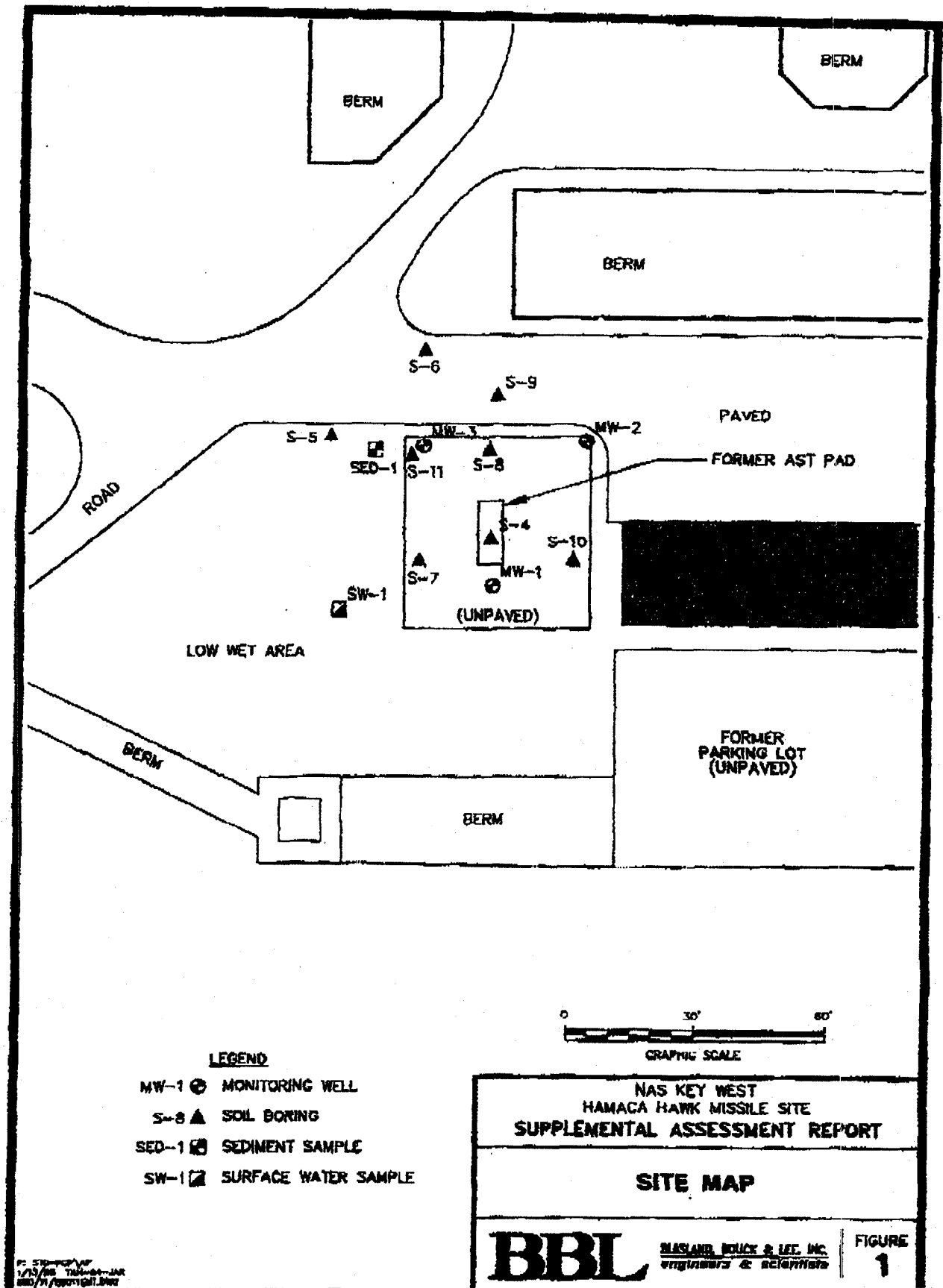
Naval Air Station Key West
Key West, Florida

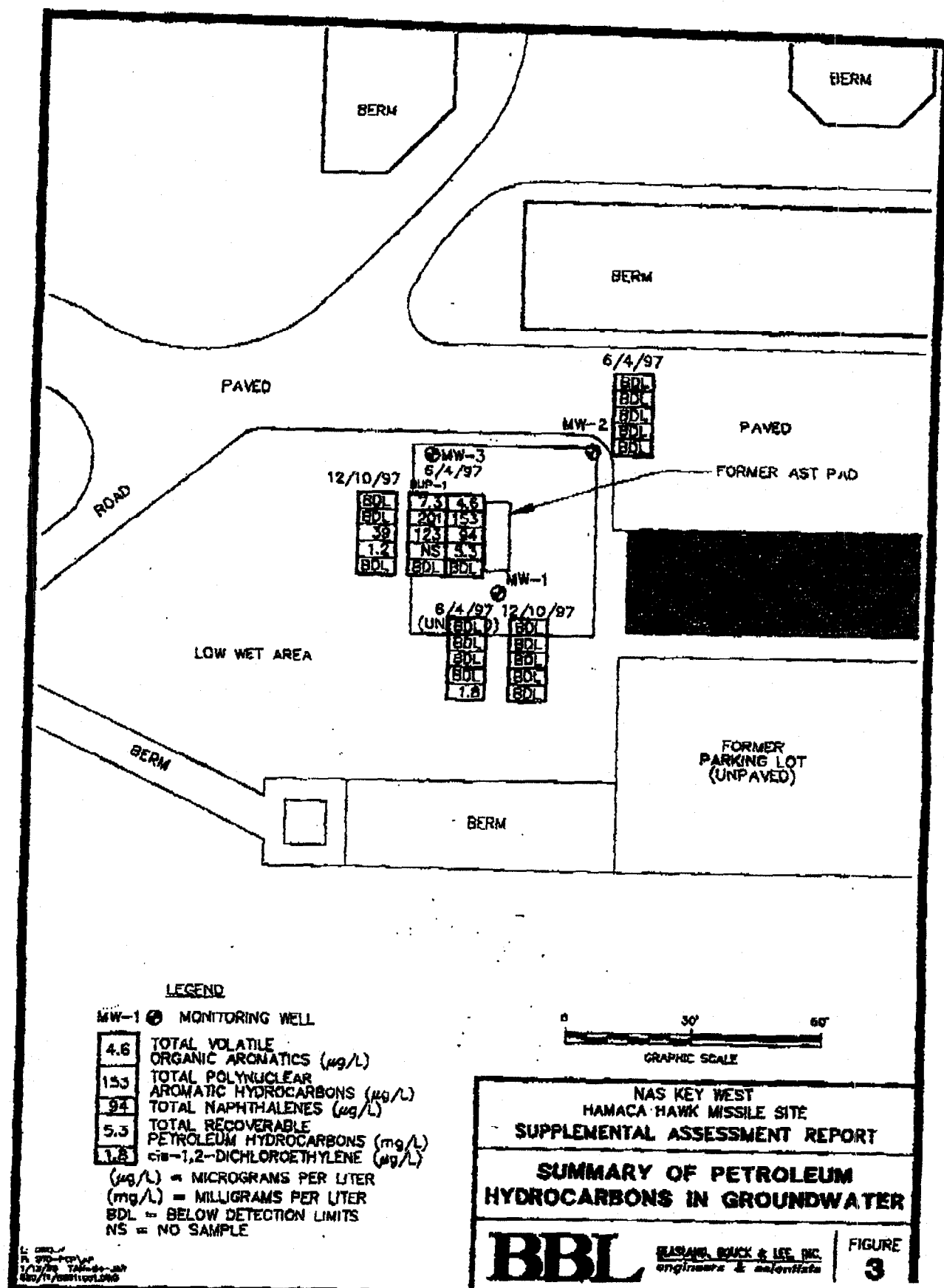
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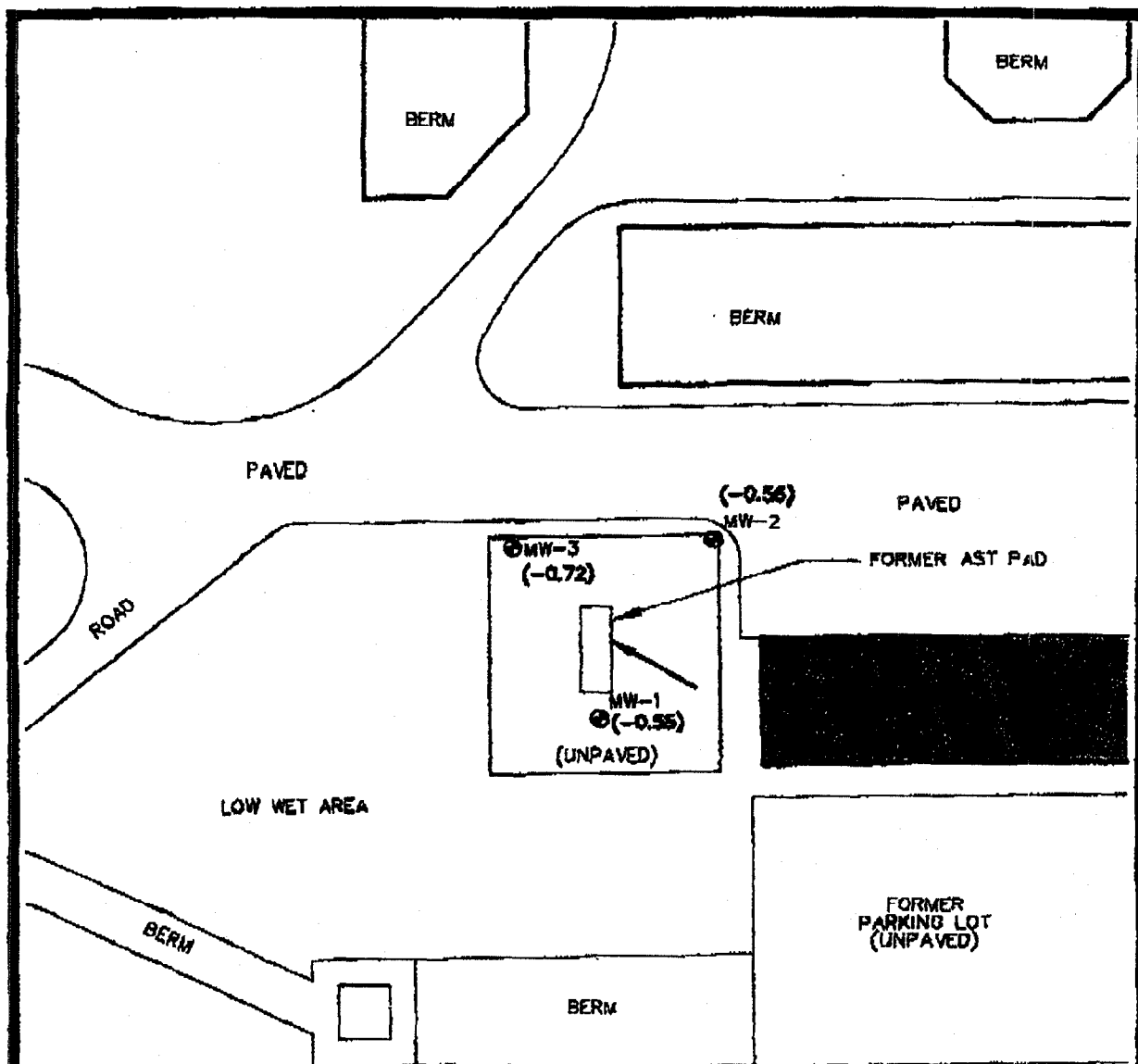
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engineers & scientists







LEGEND

- MW-1 MONITORING WELL
- (-0.72)** RELATIVE WATER TABLE ELEVATION (FEET, MEAN SEA LEVEL)
- GENERAL DIRECTION OF GROUNDWATER FLOW



**NAS KEY WEST
HAMACA HAWK MISSILE SITE
SUPPLEMENTAL ASSESSMENT REPORT**

**HYDRAULIC GRADIENT
(12/10/97) MEAN LOW TIDE**

BBL

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FIGURE
2

TOTAL P.03

Table 3

Summary of Ground Water Analytical Results

Supplemental Assessment Report
Hamaca Hawk Missile Site
Naval Air Station Key West, Florida

Sample Date: June 4, 1997						
MW-1	<1.0	BDL	BDL	<1.0	<1.0	1.8
MW-2	<1.0	BDL	BDL	<1.0	<1.0	<1.0
MW-3	<1.0	4.6	94	153	5.3	<1.0
Dup-1 (MW-3)	<1.0	7.3	123	201	NS	<1.0
Sample Date: December 10, 1997						
MW-1	<1.0	BDL	<10	<10	<0.30	<1.0
MW-3	<1.0	BDL	39	<10	1.2	<1.0
62-770 Target Level	1	50	100	Detection Limit (10 max.)	5	70

Notes:

<1.0 = Below detection limit specified.

BDL = Analyte is below detection limit (detection limits vary).

µg/L = Micrograms per liter

mg/L = Milligrams per liter

NS = No Sample

Shading indicates a parameter above target level.

11 Total Volatile Organic Aromatics = Sum of benzene, toluene, ethylbenzene, and xylene.

12 Total Naphthalenes = Sum of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

13 Total PAHs = Sum of Polynuclear Aromatic Hydrocarbons.

14 TRPH = Total Recoverable Petroleum Hydrocarbons. For 04/97 sample date - EPA Method 816.1. For 12/10/97 sample date - FL-PRO.

15 cis-1,2-DCE = cis-1,2-dichloroethylene.

Sources: Blackland, Bouck & Lee, Inc., 1987; Savannah Laboratories and Environmental Services, Inc., 1987.

Table 4

Summary of Analytical Data
Surface Water Sample SW-1
Sample Date: December 10, 1997

Supplemental Assessment Report
Hunaco Hawk Missile Site
Naval Air Station Key West, Florida

Acenaphthene	<10	3
Acenaphthylene	<10	<0.031
Benzo(a)pyrene	<10	<0.031
Benzo(g,h,i)perylene	<10	<0.031
Benzo(b,k)fluoranthene	<10	<0.031
Chrysene & Benzo(a)anthracene	<10	<0.031
Fluoranthene	<10	0.3
Fluorene	<10	30
Indeno(1,2,3-c,d)pyrene & Dibenzo(a,h)anthracene	<10	<0.031
Naphthalene	<10	26
Phenanthrene	<10	<0.031
Anthracene	<10	0.3
Pyrene	<10	0.3
1-Methylnaphthalene	<10	NE
2-Methylnaphthalene	<10	NE

Notes:

NE = Not Established

µg/L = Micrograms per liter

FI = 68-770, FAC or 82-502, FAC

Source: Standard, DuPont & Lee, Inc., 1967, Savannah Labs, 1967

Resampling - Det. Limit
too high for all parameters
except fluorene + naphthalene.

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P.04

Table 5

Summary of Analytical Data
Soil Sample S-11
Sample Date: December 10, 1997

Supplemental Assessment Report
Hamaca Hawk Missile Site
Naval Air Station Key West, Florida

Compound	mg/kg	mg/kg
Acenaphthene	<7.1	2,300
Acenaphthylene	20	1,100
Anthracene	<7.1	19,000
Benzo(a)anthracene	<7.1	1.4
Benzo(a)pyrene	<7.1	0.1
Benzo(b)fluoranthene	<7.1	1.4
Benzo(g,h,i)perylene	<7.1	2,300
Benzo(k)fluoranthene	<7.1	15
Chrysene	<7.1	140
Dibenzo(a,h)anthracene	<7.1	0.1
Fluoranthene	<7.1	2,800
Fluorene	21	2,100
Indeno(1,2,3-c,d)pyrene	<7.1	1.6
Naphthalene	15	1,000
Phenanthrene	<7.1	1,900
Pyrene	<7.1	2,200
Benzene	<0.0054	1.1
Ethylbenzene	<0.0054	240
Toluene	<0.0054	300
Total Xylenes	<0.0054	290
1,2-Dichloroethane	<0.0054	0.6
MTBE	<0.0054	350
TPH FL-PRO	3,500	350

Notes:

mg/kg = Milligrams per kilogram

/l = FAC, Chapter 62-770

Source: Blackland, Bouck & Lee, Inc., 1997; Sawtman Labs, Inc., 1997

Table of Contents

Section 1.

Introduction and Background Information 1-1

- 1.1 Purpose 1-1
- 1.2 Site Location and Area of Investigation 1-1
- 1.3 Site History 1-2
- 1.4 Regional Geology and Hydrogeology 1-2
 - 1.4.1 Regional Geology 1-2
 - 1.4.2 Regional Hydrogeology 1-2
 - 1.4.3 Potable Well Survey 1-3

Section 2.

Site Assessment 2-1

- 2.1 Soil Borings and Monitoring Wells 2-1
 - 2.1.1 Soil Borings 2-1
 - 2.1.2 Monitoring Well Installation 2-1
- 2.2 Site Specific Geology and Hydrogeology 2-2
 - 2.2.1 Site Geology 2-2
 - 2.2.2 Aquifer Characteristics 2-2
 - 2.2.3 Aquifer Classification 2-2
- 2.3 Groundwater Flow 2-3
- 2.4 Soil and Groundwater Quality 2-3
 - 2.4.1 Quality Assurance 2-3
 - 2.4.2 Soil Assessment 2-3
 - 2.4.3 Groundwater Assessment 2-4

Section 3.

Conclusions and Recommendations 3-1

- 3.1 Conclusions 3-1
- 3.2 Recommendations 3-1

Section 4.

References 4-1

Figures

- 1-1 Site Location Map
- 1-2 Site Map
- 2-1 Petroleum Headspace Vapors in Vadose Zone
- 2-2 Hydraulic Gradient (6/4/97) Mean High Tide
- 2-3 Hydraulic Gradient (6/4/97) Mean Low Tide
- 2-4 Summary of Petroleum Hydrocarbons in Groundwater

Tables

- 2-1 Monitoring Well Completion Summary
- 2-2 Tidal Influence on Water Levels
- 2-3 Summary of Organic Vapor Analysis
- 2-4 Final Water Quality Field Measurements
- 2-5 Summary of Groundwater Analytical Results

Appendices

- A AST Closure Report
- B Monitoring Well Construction Details and Lithologic Descriptions
- C Laboratory Analytical Results

1. Introduction and Background Information

1.1 Purpose

Blasland, Bouck & Lee, Inc. (BBL) prepared this Contamination Assessment Report (CAR) to document an investigation associated with a discharge of diesel fuel at the Hamaca Hawk Missile Site, located on Government Road in Key West, Florida. The Hamaca Hawk Missile Site is part of the U.S. Naval Air Station (NAS) Key West. The Florida Department of Environmental Protection (FDEP) facility identification number for the site is No. 449402036.

The purpose of the Contamination Assessment (CA) was to determine the degree and extent of potential soil and groundwater contamination by petroleum product resulting from the discharge of an unknown quantity of fuel, and to determine the factors controlling contaminant migration. BBL personnel performed the assessment in accordance with Florida Administrative Code (FAC) Chapter 62-770 and FDEP's *Guidelines for the Preparation of Contamination Assessment Reports for Petroleum Contaminated Sites* (October, 1989).

Pursuant to Contract Number N62467-94-D-2762, the United States Navy (USN) authorized BBL to initiate contamination assessment activities at the site on May 27, 1997. These activities were conducted in June, 1997. The CA field investigation consisted of installing 10 soil borings, constructing three monitoring wells, measuring groundwater elevations in the monitoring wells to determine the groundwater flow directions, conducting field and laboratory analyses of soil and groundwater samples, and conducting a potable well survey. Field screening of soil samples was conducted using an organic vapor analyzer (OVA). This report presents a summary of these activities, results of the soil and groundwater quality assessment, and recommendations for No Further Action.

1.2 Site Location and Area of Investigation

The Hamaca Hawk Missile Site is located on the U.S. NAS Key West property, on Government Road in Key West, Monroe County, Florida. The site is located specifically at latitude 24° 33' and longitude 81° 45', as referenced on the Key West, Florida, U.S. Geological Survey (USGS) topographic quadrangle map (**Figure 1-1**).

The former tank area is on an unpaved parcel of land approximately 45 feet by 45 feet in area, that appears to have been created from fill. There is a fairly sharp drop of approximately 3.5 to 4 feet to the surrounding pond area. The former diesel tank area is bounded on the north by a roadway and further north by bermed areas, to the east by an abandoned maintenance garage, to the southeast by an unpaved former parking area, to the south and west by a pond. **Figure 1-2** shows the site vicinity. The property owned by NAS Key West is bounded to the north and east by residential areas, to the south by the Key West International Airport, and to the west by park property owned by the City.

Drainage from the impervious (paved) surfaces is by runoff, predominantly toward the pond areas to the south and west of the former tank area. No visual evidence of petroleum spillage was present on the surface water in the pond during any of the site visits by BBL, and none has been reported by Navy personnel. Drainage from the permeable surfaces is through direct infiltration of water through the soils.

No underground utilities are present in the vicinity of the former AST site. Aboveground piping for electric lines parallel the southern boundary of the former tank area, but are not in use. The lines run to the former missile launch sites.

1.3 Site History

The site had one 2,000-gallon steel aboveground storage tank (AST), tank 101, that was removed on April 26, 1996. All piping associated with the tank was also removed. The soil contaminant levels and groundwater at the site were above state target levels, according to the Closure Assessment Form dated June 17, 1996. No free product was present, however; a groundwater sample collected from a temporary monitor well indicated 9 micrograms per liter ($\mu\text{g/L}$) ethylbenzene, 3 $\mu\text{g/L}$ acenaphthalene, 4 $\mu\text{g/L}$ fluorene, 48 $\mu\text{g/L}$ total naphthalenes, and 4 $\mu\text{g/L}$ phenanthrene. A copy of the Closure report is provided in **Appendix A**.

The Hamaca Hawk Missile site had a second diesel fuel AST (500 gallons capacity) which was removed from the site at the same time as the 2,000-gallon AST. Groundwater and soil testing at the 500-gallon AST indicated that no contamination was present. The 500-gallon AST was located approximately 180 feet to the northwest of the 2,000-gallon AST site. No further investigation was performed at the 500-gallon AST and none is recommended.

1.4 Regional Geology and Hydrogeology

The Florida Keys are located in Monroe County at the southern tip of the Florida peninsula. Monroe County can be divided into two distinct zones: the portion on the mainland of Florida, and the Florida Keys, which stretch 135 miles from the mainland to the southwest. The Florida Keys are composed of numerous small islands (keys). The land area of the Florida Keys totals approximately 105 square miles.

Little information regarding the regional geology and hydrogeology of the lower Florida Keys is available; however, several publications were obtained which included some information on the Florida Keys. These publications are referenced in **Section 4** of this report.

The climate of the Florida Keys is subtropical to tropical. The Keys receive some of the lowest amounts of rainfall in Florida. The mean annual rainfall in Key West is 25 inches per year (FGS, 1986).

1.4.1 Regional Geology

The Florida Keys are divided into the upper Keys and the lower Keys. The upper Keys, from Key Largo to Big Pine Key, are composed mainly of the Key Largo Limestone, a dead Pleistocene coral reef. The lower Keys, from Big Pine Key to Key West, are composed of the Miami Limestone, which is sometimes called the Miami Oolite. The Miami Limestone is typically a white, sandy oolitic limestone reaching a maximum thickness of 40 feet. The Miami Limestone is underlain by the Key Largo Limestone, which is considered bedrock. The thickness of the Key Largo Limestone varies from approximately 75 to 200 feet.

1.4.2 Regional Hydrogeology

Two aquifer systems are present beneath Monroe County, the surficial aquifer system and the Floridan aquifer system. These aquifer systems are separated from one another by the Hawthorn confining zone. The top of the Floridan aquifer is estimated to be at least 800 feet below land surface (BLS). However, in south Florida the Tamiami Formation acts as a confining unit. The Tamiami Formation is composed of limestone, clay, and marl, and forms the upper part of the basal confining unit of the surficial aquifer. The depth of the Tamiami Formation in the lower Keys is estimated to be approximately 200 feet BLS.

The surficial aquifer system is present beneath all of the keys, however, on most of the keys the aquifer contains salt or brackish water. The water quality of the Floridan aquifer system is poor throughout all of Monroe County and decreases in quality to the south. Total dissolved solids concentrations range from 3,430 to 37,500 milligrams per liter (mg/L). A Floridan aquifer system well in Marathon, Florida, produced water that was saltier than seawater.

There is no source of large quantities of potable groundwater in the Florida Keys. Drinking water to the Florida Keys is supplied by wellfields in Dade County and is delivered by the Florida Keys Aqueduct Authority pipeline that runs from Dade County to Key West. Desalination plants that produce potable water from seawater provide backup capabilities. Small lenses of freshwater may exist beneath the larger keys, but these lenses can produce only very limited quantities of water.

1.4.3 Potable Well Survey

A survey of wells within a one-half mile radius of the site was performed to identify potential users of groundwater in the immediate area. The Key West office of the Florida Department of Health and Rehabilitative Services (HRS) was contacted concerning any public or private, potable wells on Key West. HRS indicated that according to their records, no wells exist on Key West; all potable water is piped in from the mainland via the Florida Keys Aqueduct Authority.

2. Site Assessment

2.1 Soil Borings and Monitoring Wells

The field investigation was conducted from June 2, through June 5, 1997. Soil assessment activities included the advancement of 10 soil borings and field headspace screening of soils to determine the presence and define the limits of "excessively contaminated" and "contaminated" soils. Groundwater assessment activities included the installation of three monitoring wells, collection of groundwater samples from the monitoring wells for laboratory analysis, and determination of groundwater elevations. In addition, lithologic data were collected during soil boring and monitoring well installation.

Prior to installing soil borings and monitoring wells at the site, an underground utility location check was performed by NAS personnel by reviewing existing site plans.

All drilling was performed by a certified drilling contractor (Precision Drilling, Inc.). Prior to beginning work and before installing each soil boring and monitoring well, the drilling rig and associated equipment were decontaminated by removing loose soil from the equipment, followed by steam-cleaning. Potable water for steamcleaning was obtained from the fire station at Trumbo Point and Alconox (non-phosphate soap) were used for decontamination.

2.1.1 Soil Borings

Ten soil borings (SB1 through SB10) were advanced (**Figure 2-1**) to delineate the extent of soil contamination. Soil borings were advanced to a depth of approximately 4 to 5 feet BLS with a post-hole digger or truck-mounted drill rig with a 2-inch by 24-inch stainless steel split spoon sampler. Soil samples were collected from the split-spoon at 2-foot intervals to a depth of approximately 4 to 5 feet BLS, where the water table was encountered. Rock and soil types were described by a professional geologist.

2.1.2 Monitoring Well Installation

The rationale for the placement of the monitoring wells was based on the soil screening results and observations made in the field. Three shallow monitoring wells were installed at the site to evaluate the presence and extent of hydrocarbon contamination in groundwater (**Figure 2-2**). The wells were installed under the observation of a BBL geologist and were constructed to allow for representative sampling of groundwater and free product, if present, at the site.

Wells MW-1 through MW-3 were installed on June 2, 1997, to a depth of 12 feet BLS using a hollow-stem auger. The three 2-inch monitoring wells were constructed to define the horizontal extent and degree of dissolved petroleum hydrocarbons at the site.

All monitor wells were installed with a 4.25-inch inside diameter (I.D.) hollow-stem auger, and were constructed with a 2-foot section of 2-inch diameter, Schedule 40 PVC solid casing connected flush to 10 feet of 2-inch diameter, 0.010-inch slot, Schedule 40 PVC mill-slotted screen. The annular space around the well screens was filled to 0.5 foot above the screened interval using 30/45 graded silica sand filter media during auger removal. Approximately 0.5 feet of fine sand was used as a plug to prevent grout from seeping into the filter pack. The remaining annular space in each well was then grouted to land surface with a neat cement slurry (Portland, Type I). All wells were fitted with locking caps and locks and contained within flush-mounted, bolt-down, traffic-bearing manholes.

A monitoring well completion summary is included as **Table 2-1**. Monitoring well construction details and drilling logs are provided in **Appendix B**. The locations of all monitoring wells are depicted on **Figure 2-2**.

All wells were developed by purging and surging using a centrifugal pump and reinforced hose to remove fine-grained sediments. The hose was properly decontaminated and steam-cleaned prior to placement in each well. The wells were developed until the purge water was visually free of sand and silt. Development water from the wells was discharged onto the ground in the vicinity of the well.

2.2 Site Specific Geology and Hydrogeology

2.2.1 Site Geology

Lithologic data about the site were gathered from the soil samples in conjunction with monitoring well installation. Lithologic descriptions are included with the monitoring well construction details presented in **Appendix B**.

Based on observations during advancement of the soil borings, the surficial aquifer material can be generally classified as unconsolidated silty to clayey, white, oolitic lime sand to 12 feet BLS, the deepest unit drilled.

2.2.2 Aquifer Characteristics

Because the groundwater analytical data does not appear to warrant active site rehabilitation, no slug tests were performed for this CA. However, slug tests performed by BBL at Sigsbee Marina on nearby Dredgers Key resulted in calculated hydraulic conductivities for the upper surficial aquifer in similar geologic materials to the Hamaca Hawk Missile Site ranging from 6.5×10^{-3} feet per minute (ft/min) to 1.31×10^{-2} ft/min in 12-foot deep monitor wells (BBL, 1996).

Based on the Sigsbee Marina data, the transmissivity in the surficial aquifer may be estimated using the equation:

$$T = Kb$$

Where: T = transmissivity
K = hydraulic conductivity
b = aquifer thickness

Based on literature review, the surficial aquifer thickness is estimated to be a maximum of 200 feet thick (the maximum depth of the Key Largo limestone). For aquifer characteristic calculations, a thickness of 100 feet was considered more reasonable for potential impacts by petroleum constituents. The transmissivity of the surficial aquifer at the site may be estimated to range from 1,872 square feet per day (ft²/day) to 3,773 ft²/day in the upper surficial aquifer.

2.2.3 Aquifer Classification

Chapter 62-520, FAC classifies most aquifers in the state as G-II. A G-II aquifer is for potable water use, with groundwater having a total dissolved solids (TDS) content less than 10,000 mg/L. Although TDS was not measured in the groundwater samples collected from this site, groundwater analysis of samples collected by BBL for studies on other nearby keys revealed TDS concentrations close to or greater than 10,000 mg/L. BBL collected groundwater samples from three monitoring wells located at the Boca Chica Tank Farm site (BBL, 1996) and analyzed them for TDS by EPA Method 160.1. Results of the TDS analysis indicated that groundwater samples collected from one shallow and one deep well contained TDS concentrations of 43,000 mg/L and 37,000 mg/L,

respectively. One sample collected from a shallow well contained a TDS concentration of 9,100 mg/L. Rule 62-520.410(1), FAC states that a Class G-III aquifer is one which has a TDS content of 10,000 mg/L or greater; or which has total TDS of 3,000 to 10,000 mg/L and either has been reclassified by the Environmental Regulation Commission as having no reasonable potential as a future source of drinking water, or has been designated by the FDEP as an exempted aquifer pursuant to Rule 62-28.130(3), FAC. Based on the TDS results from Boca Chica Key, and the fact that the groundwater in the lower Florida Keys is not an approved groundwater source (according to Lisa Gordon, FDEP Marathon) the aquifer on Key West should most-likely be classified as a Class G-III aquifer.

2.3 Groundwater Flow

Tops of casings of all monitor wells were surveyed to determine the elevations relative to an assumed elevation of 5 feet mean sea level (MSL) for a temporary benchmark located at the maintenance building. Due to the proximity of the site to the ocean, a tidal fluctuation study was performed to investigate the potential influence of the tides on the direction and velocity of groundwater flow. Information on the high and low tide times was obtained and is provided in **Table 2-2**. The water levels in all wells were measured at three different times on June 4 and 5, 1997. Measurements were recorded within an accuracy of 0.01 feet with a water level indicator. Groundwater elevations were determined by subtracting the depth to groundwater from the relative top-of-casing elevation.

Groundwater contour maps for June 4, 1997 at 10:30 a.m., representing a near high tide and on June 4, 1997 at 1:30 p.m., representing a near low tide, are provided as **Figures 2-2** and **2-3**, respectively. The data indicates that the groundwater flow is predominantly toward the west/southwest. Groundwater flow is apparently influenced by the pond.

2.4 Soil and Groundwater Quality

2.4.1 Quality Assurance

All sampling was performed in accordance with BBL's Comprehensive Quality Assurance Plan (CompQAP) No. 880552G approved by FDEP. The laboratory used for analytical services (Savannah Labs) also has an approved CompQAP on file with FDEP. The CompQAP describes the methods utilized by BBL personnel for collection, preservation, transportation, and analysis of soil and groundwater samples.

2.4.2 Soil Assessment

Soil samples were collected from 2-foot intervals to a depth of 4 to 5 feet BLS where the water table was encountered. Soil samples were analyzed in the field using a calibrated Foxboro Model 128 Organic Vapor Analyzer (OVA) equipped with a flame-ionization detector (FID) in accordance with the procedure outlined in FAC Rule 62-770.200(2). This procedure, including the screening method used to distinguish naturally occurring methane gas from the petroleum hydrocarbon soil vapors, is outlined as follows. Soil samples were placed in two 16-ounce jars, covered with aluminum foil, and securely capped. The jars were maintained at 75° to 85° Fahrenheit (°F) for approximately 10 minutes. The probe of the OVA was then inserted through the foil, and the headspace within the mason jar was analyzed for its total organic vapor content. If the total vapor content was greater than 10 parts per million (ppm), the process was repeated on the duplicate sample using an activated carbon filter to determine the methane concentration in the soil. The filtered concentration was subtracted from the total (unfiltered concentration) to obtain the actual or corrected concentration of petroleum vapors in the headspace.

Because diesel fuel was discharged at the site, the petroleum contaminants at the site are classified as constituents of the Kerosene Analytical Group, as defined in Chapter 62-770, FAC. FAC Chapter 62-770 states that soils with organic vapor concentrations greater than 50 ppm for a Kerosene Analytical Group site are termed "excessively contaminated." Soils with an organic vapor concentration greater than background, but less than 50 ppm, are classified as "contaminated." Results of the OVA headspace analysis recorded for all samples are presented in **Table 2-3**. The OVA screening results indicate that only one sample produced vapor in the vadose zone (above the water table) at "excessively contaminated" levels. Sample S-3 (in boring MW-3) had an OVA reading of 70 parts per million at a depth of 3 feet. Highest OVA readings in the vadose zone are presented on **Figure 2-1**.

2.4.3 Groundwater Assessment

Free product was not detected in any of the soil borings or monitoring wells on site.

Groundwater samples were collected for laboratory analysis to assess the presence and extent of dissolved petroleum contamination in the groundwater at the site. Monitoring wells MW-1 through MW-3 were sampled on June 4, 1997. Appropriate quality assurance samples were collected and analyzed, including a duplicate sample from well MW-3, an equipment blank, and a trip (method) blank which was transported to and from the site in the sample kit.

To ensure the presence of formation water in the wells, the water levels were measured in the wells, then the monitoring wells were purged of three to five well volumes until the pH, specific conductance, and temperature had stabilized. Stabilization was considered complete when consecutive measurements of each parameter varied no more than 5 percent. **Table 2-4** summarizes the final pH, temperature, specific conductance, and turbidity readings taken prior to sampling. The field analytical equipment was calibrated according to the manufacturer's directions prior to sampling the purge water. Purging was accomplished using Teflon bailers. Purge water was discharged onto the ground to evaporate and not allowed to flow off site.

Once purging was completed, samples were collected using Teflon bailers. All sampling was performed and equipment was decontaminated in accordance with BBL's FDEP-approved CompQAP.

All samples were collected and placed in laboratory-prepared (appropriately preserved) sample containers, stored under ice, and shipped via overnight courier in sealed coolers to Savannah Laboratories, Inc., in Deerfield Beach, Florida. Because diesel fuel was discharged at the site, the samples were analyzed for the Kerosene Analytical Group parameters, which include the following analyses:

- a. EPA Method 601 (Purgeable Halocarbons).
- b. EPA Method 602 (Volatile Aromatics, including MTBE).
- c. EPA Method 610 (Polynuclear Aromatic Hydrocarbons).
- d. EPA Method 239.2 (Lead).
- e. EPA Method 504.1 (Ethylene Dibromide [EDB]).
- f. EPA Method 418.1 (Total Recoverable Petroleum Hydrocarbons).

Groundwater laboratory analytical results (**Table 2-5**) indicated no dissolved concentrations of petroleum hydrocarbons above the FDEP "No Further Action" (NFA) target levels for a Class G-II or G-III aquifer as established in Chapter 62-770, FAC.

Benzene was not detected in any of the groundwater samples collected from monitoring wells on site. Total VOAs (volatile organic aromatics, defined as the sum of benzene, toluene, ethylbenzene, and xylenes) were detected in

downgradient well MW-3 at a concentration of 4.6 µg/L and 7.3 µg/L, for the sample and duplicate (DUP-1), respectively. The FDEP target level for total VOAs is 50 µg/L. Total VOAs were not detected in monitoring wells MW-1 or MW-2.

No EPA Method 610 parameters were detected in the samples from MW-1 or MW-2. Total Naphthalenes (sum of naphthalene and 1- and 2-methylnaphthalene) was reported at a concentration of 94 µg/L and 123 µg/L for sample MW-3 and its duplicate DUP-1, respectively. The Chapter 62-770, FAC target level for total naphthalenes is 100 µg/L. Total Polynuclear Aromatic Hydrocarbons (PAHs) were detected in the groundwater sample from MW-3 at a concentration of 153 µg/L and 201 µg/L for the sample and duplicate, respectively. This is above the maximum FDEP target level of 10 µg/L.

Total Recoverable Petroleum Hydrocarbons (TRPH) were detected only in the sample from MW-3, at a concentration of 5.3 µg/L, which is slightly above the FDEP Chapter 62-770, FAC target level of 5 µg/L.

Except for 1.8 ug/L cis-1,2-dichloroethylene in the sample from well MW-1, no parameters analyzed for were detected in the groundwater samples from wells MW-1 or MW-2. The Maximum Contaminant Level for cis-1,2-dichloroethylene is 70 µg/L.

The complete laboratory reports and chain-of-custody records are provided in **Appendix C**. **Figure 2-5** illustrates the concentrations of benzene, total VOAs, total PAHs, total Naphthalenes, TRPH, and cis-1,2-dichloroethylene in the groundwater samples collected on June 4, 1997. Groundwater sampling results indicate that limited petroleum contamination is present in the immediate vicinity of MW-3. All parameter concentrations are less than the limits allowed for No Further Action for sites with Class G-III aquifers.

3. Conclusions and Recommendations

3.1 Conclusions

This contamination assessment was conducted in accordance with Chapter 62-770, FAC, to evaluate the presence and delineate the extent of petroleum hydrocarbons in the soils and groundwater resulting from the discharge of an unknown quantity of diesel fuel at Hamaca Hawk Missile Site. The following summarizes the investigation findings.

- a. No source for leaking of petroleum products is currently present on site. The tank and lines have been removed.
- b. The site is contaminated by Kerosene Analytical Group constituents. The source of the contamination may be from minor spillages or overfills occurring over a number of years.
- c. No free product has been detected in any of the soil borings or monitoring wells at the site.
- d. The groundwater table is generally encountered at the site between 4 and 5 feet BLS. The groundwater flow direction is most-likely influenced by the tides and flows generally in a westerly direction.
- e. No potable or irrigation wells exist within one-half mile radius of the site.
- f. No "excessively contaminated" soil is present on site, except 1 foot above the water table in the immediate vicinity of well MW-3.
- g. Dissolved petroleum constituents were not detected in any well at concentrations above the FDEP "No Further Action" levels for Class G-III groundwater sources. TRPH, Total Naphthalenes, and Total PAHs were detected above the FDEP target levels in well MW-3 only.
- h. Dissolved petroleum constituents in the groundwater appear to be limited to the immediate vicinity of well MW-3, which is downgradient to the former AST. Farther downgradient from MW-3 is a saline pond which has never had a reported petroleum sheen.
- i. The former AST area and surrounding land is owned by the Navy.

3.2 Recommendations

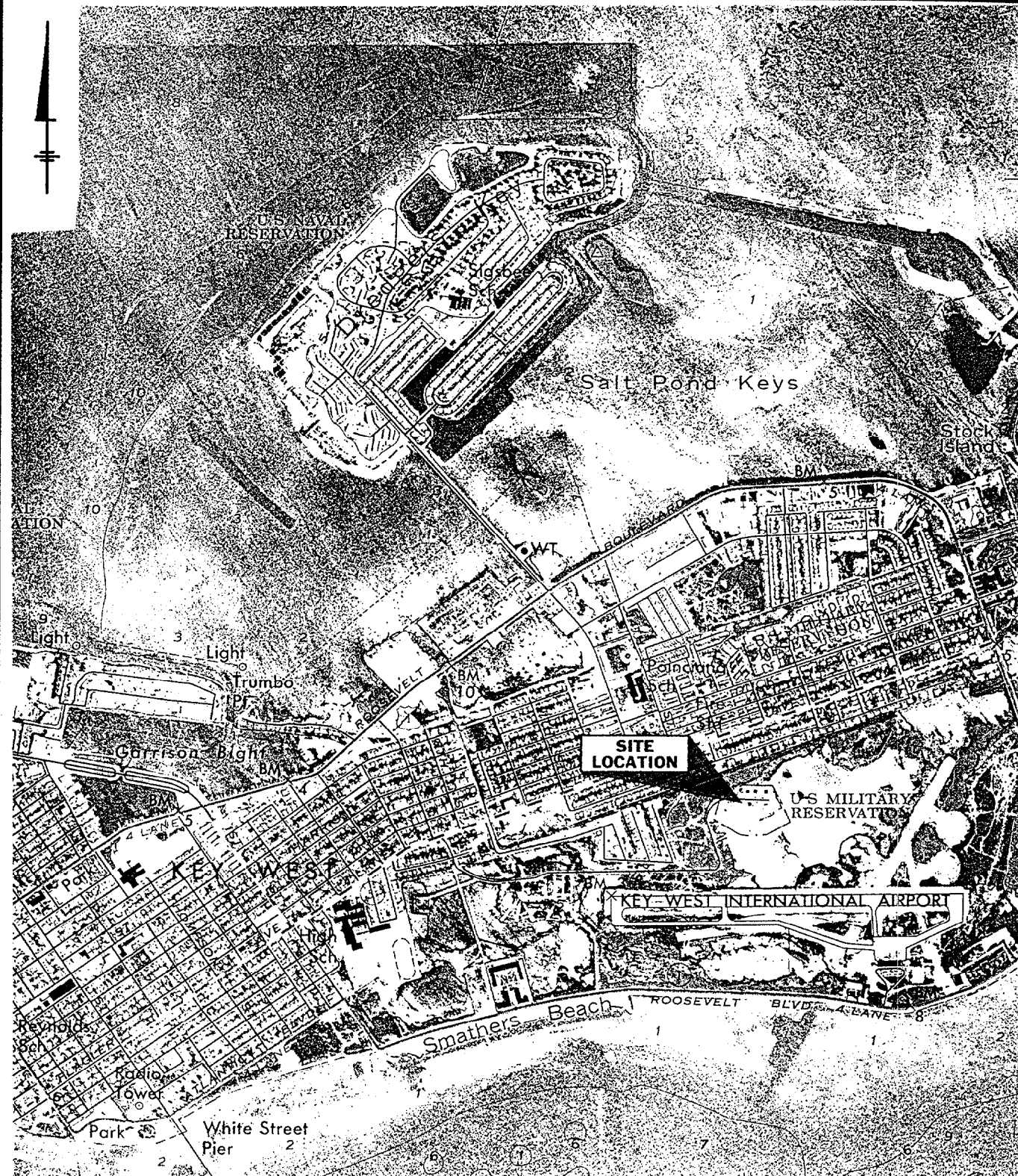
Based on the results of this contamination assessment and in accordance with Section 62-770.600(5), FAC, and "The No Further Action and Monitoring Only Guidelines for Petroleum Contaminated Sites" (October, 1990), a "No Further Action" (NFA) is recommended at this site.

4. References

- Blasland, Bouck and Lee, Inc.,** "*Boca Chica Tank Farm Contamination Assessment Report, Naval Air Station, Key West, Boca Chica Key, Florida*", FDEP Facility No. 448624969, February 1996.
- Blasland, Bouck and Lee, Inc.,** "*Sigsbee Marina Contamination Assessment Report, Naval Air Station, Key West, Sigsbee Park, Dredgers Key, Florida*", FDEP Facility No. 4488399992, October 1996.
- Bouwer, H., and Rice, R.C.,** "*A Slug Test for Determining Hydraulic Conductivity of Partially Penetrating Wells*," Water Resources Research, Vol. 12, 1976, p. 423-428.
- Florida Department of Environmental Protection,** "*Guidelines for the Preparation of Contamination Assessment Reports for Petroleum Contaminated Sites*," October 1989.
- Florida Department of Environmental Protection,** "*Guidelines for Assessment and Remediation of Petroleum Contaminated Soils*," May 1992.
- Florida Department of Environmental Protection,** "*No Further Action and Monitoring Only Guidelines for Petroleum Contaminated Sites*," October 1990.
- Geraghty & Miller,** AQTESOLV™, Aquifer Test Design and Analysis: Computer Program Version 1.0, 1989.
- Herr, J.W. and Shaw, J.E.,** "*Ambient Groundwater Quality*," South Florida Water Management District, Technical Publication 89-1, February 1989.
- Lane, E.,** "*Geology of the State Parks in the Florida Keys*," Florida Geological Survey, Leaflet No. 14, 1986.
- Miller, J.A.,** "*Groundwater Atlas of U.S. - Segment 6*," United States Geological Survey, Hydrologic Investigation Atlas 730-G, 1990.
- Rupert, F.R.,** "*A Guide Map to Geologic and Paleontologic Sites in Florida*," Florida Geological Survey, Map Series No. 125, 1989.
- Schroeder, M.C., Klein H., and Hoy, N.D.,** *Biscayne Aquifer of Dade and Brevard Counties, Florida*, Florida Geological Survey, Report of Investigations, No. 17, 1958.
- U.S. Geological Survey,** Boca Chica Key, Florida: 7.5-minute orthophotomap (topographic) series, 1971.

Figures

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SOURCE: USGS 7.5 MIN. TOPOGRAPHIC
 QUADRANGLE: KEY WEST
 REVISION: 1971
 COUNTY: MONROE
 TOWNSHIP: 67S
 RANGE: 25E

SITE
 LOCATION

0 2000' 4000'

APPROX. SCALE: 1"=2000'

P: STD-PCP\AP
 8.18.97 TAM-54 JAR
 88011/88011TP.DWG

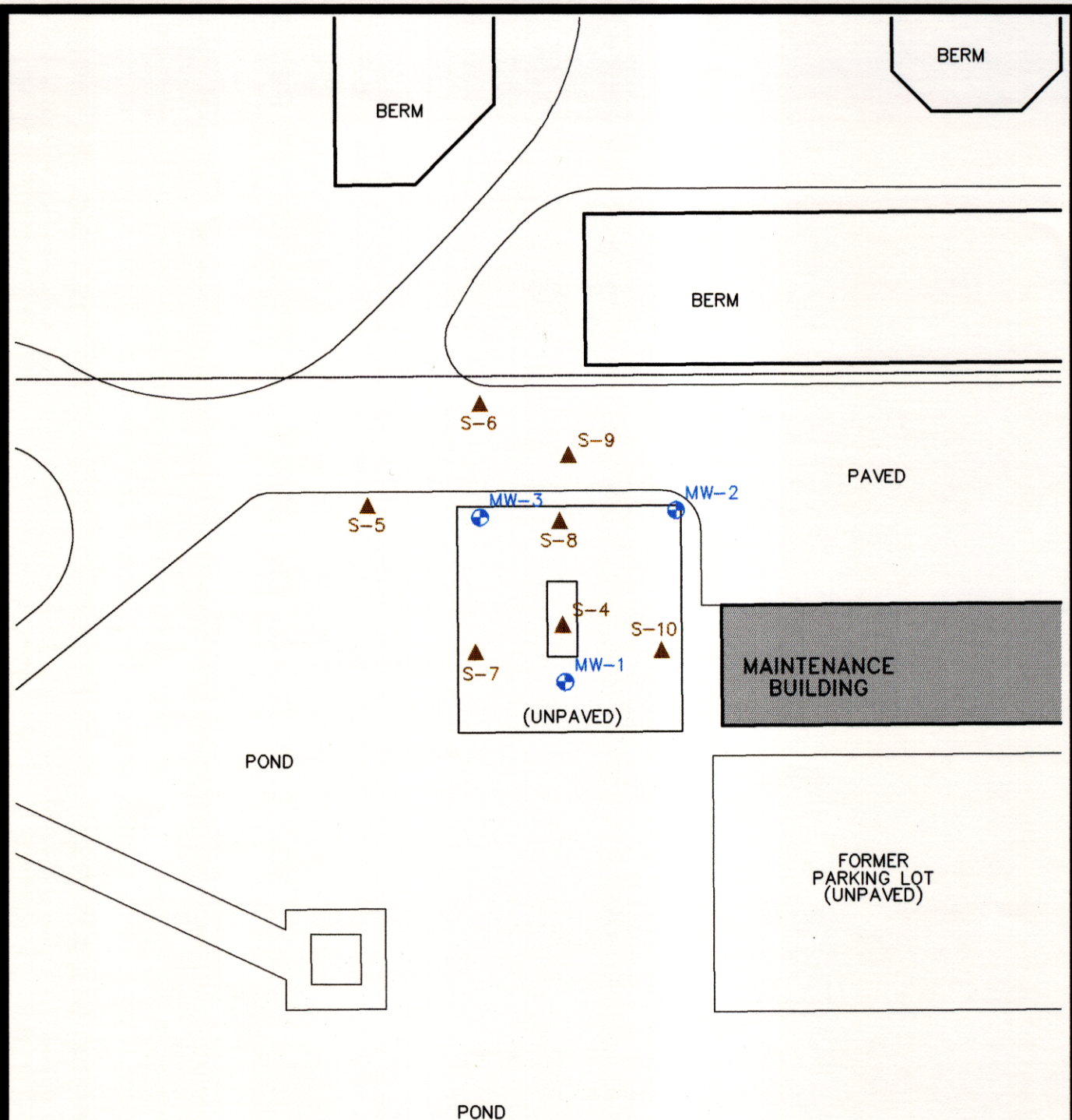
NAS KEY WEST
 HAMACA HAWK MISSILE SITE
 CAR ADDENDUM

SITE
 LOCATION MAP

BBL

BLASLAND, BOUCK & LEE, INC.
 engineers & scientists

FIGURE
1-1



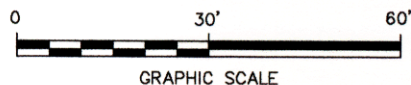
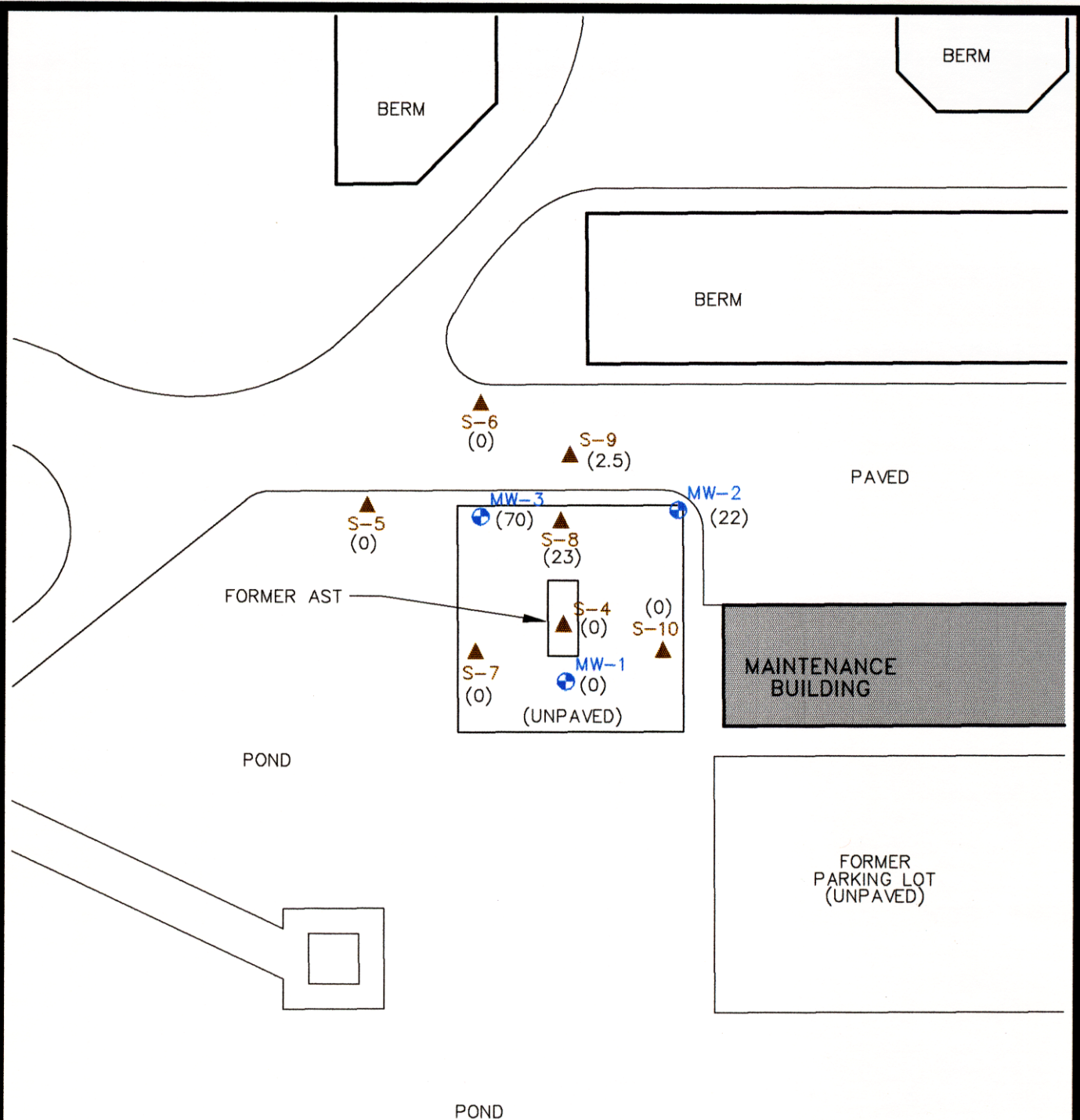
NAS KEY WEST
HAMACA HAWK MISSILE SITE
CONTAMINATION ASSESSMENT

SITE MAP



BBL

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FIGURE
1-2



LEGEND

- MW-1  MONITORING WELL
- S-8  SOIL BORING
- (23) HIGHEST OVA READING IN ppm
IN VADOSE ZONE
- ppm PARTS PER MILLION

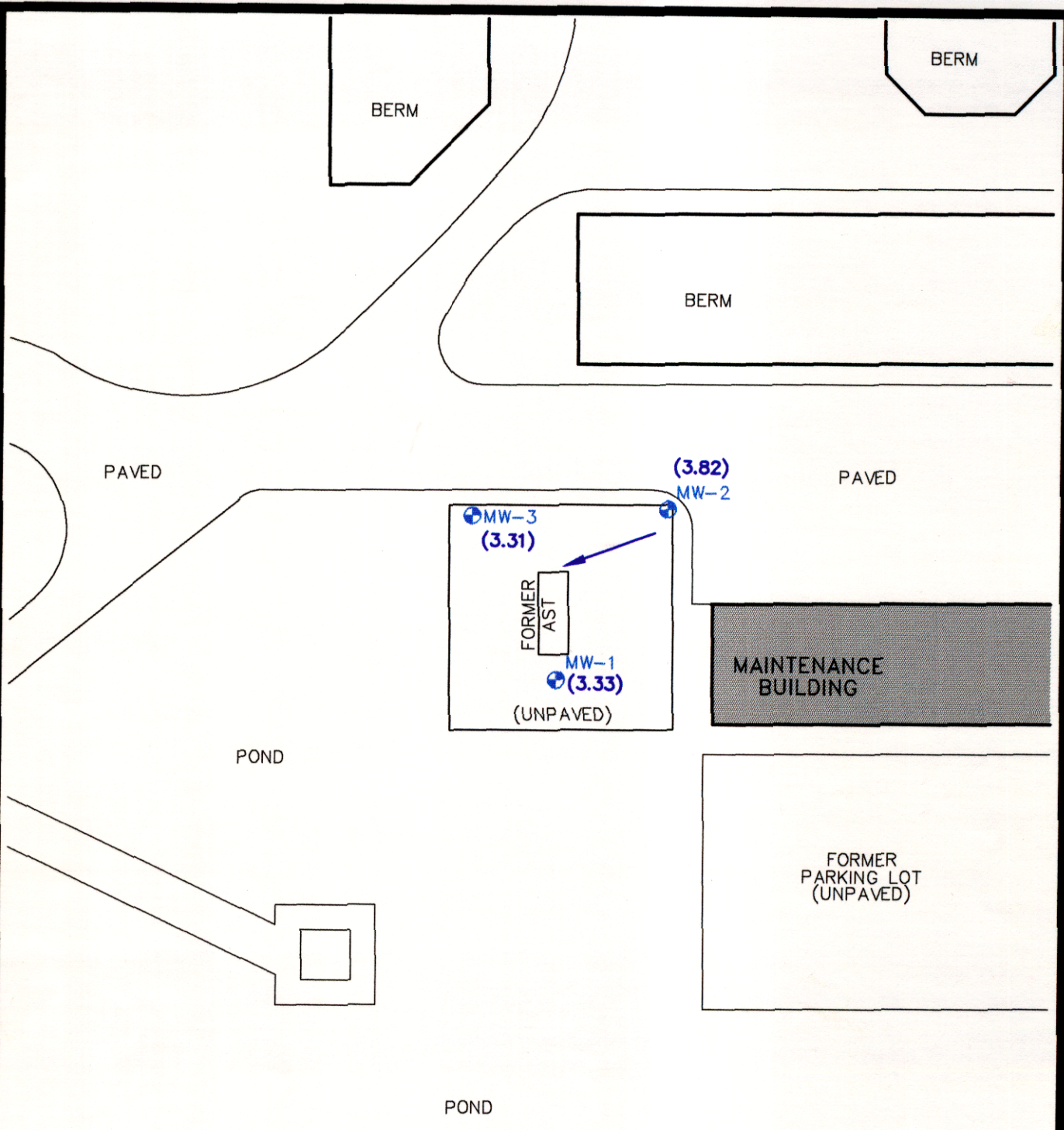
NAS KEY WEST HAMACA HAWK MISSILE SITE CONTAMINATION ASSESSMENT

PETROLEUM HEADSPACE VAPORS IN VADOSE ZONE


BBL

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FIGURE
2-1

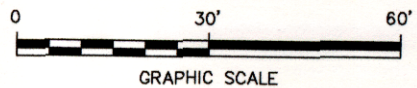


LEGEND

MW-1  MONITORING WELL

(3.33) RELATIVE WATER TABLE ELEVATION (FEET, MEAN SEA LEVEL)

 GENERAL DIRECTION OF GROUNDWATER FLOW



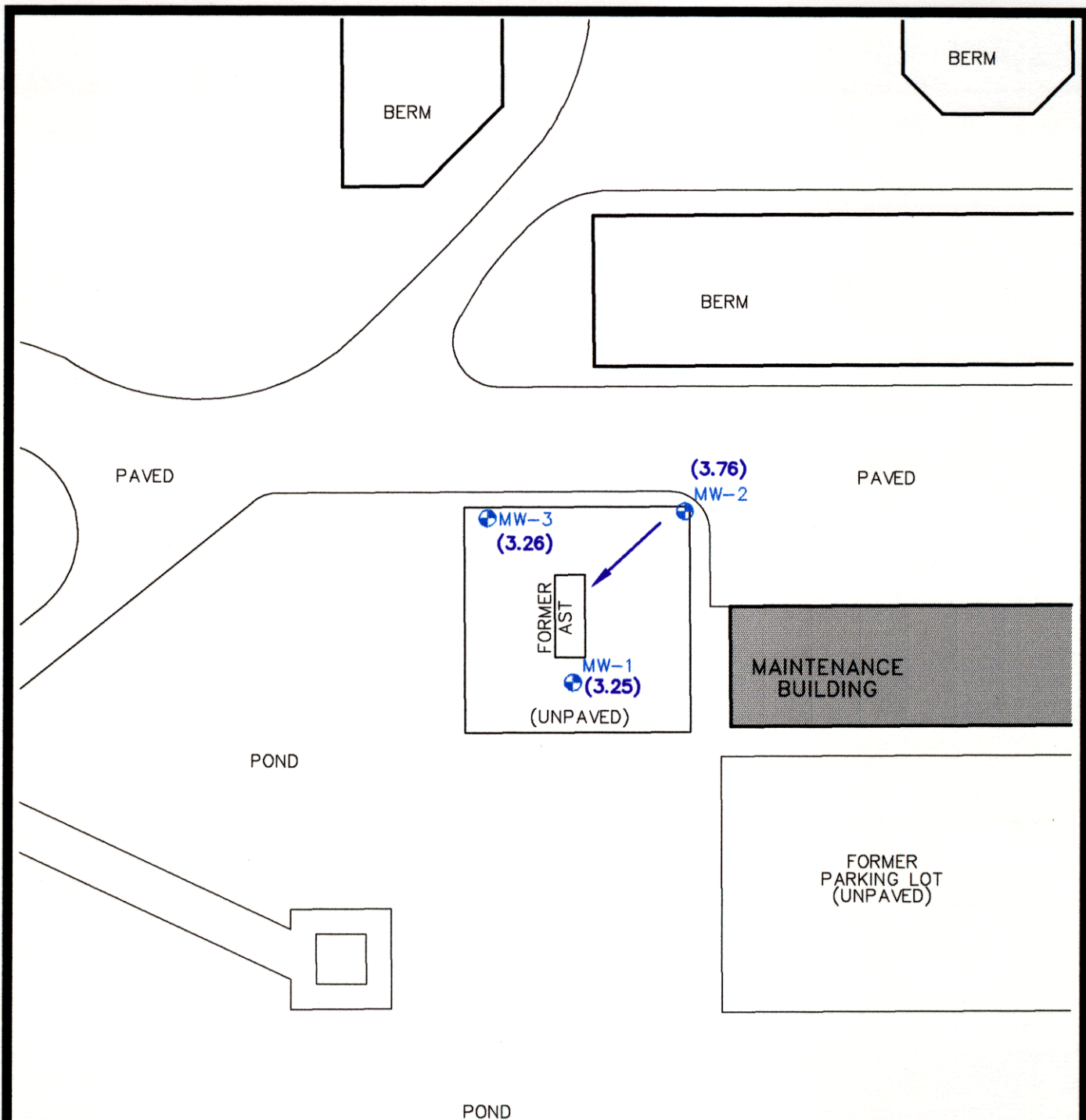
NAS KEY WEST HAMACA HAWK MISSILE SITE CONTAMINATION ASSESSMENT

HYDRAULIC GRADIENT (6/4/97) MEAN HIGH TIDE

BBL

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FIGURE
2-2

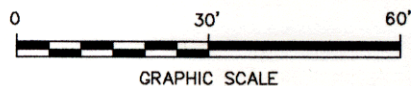


LEGEND

MW-1  MONITORING WELL

(3.25) RELATIVE WATER TABLE ELEVATION
(FEET, MEAN SEA LEVEL)

 GENERAL DIRECTION OF
GROUNDWATER FLOW



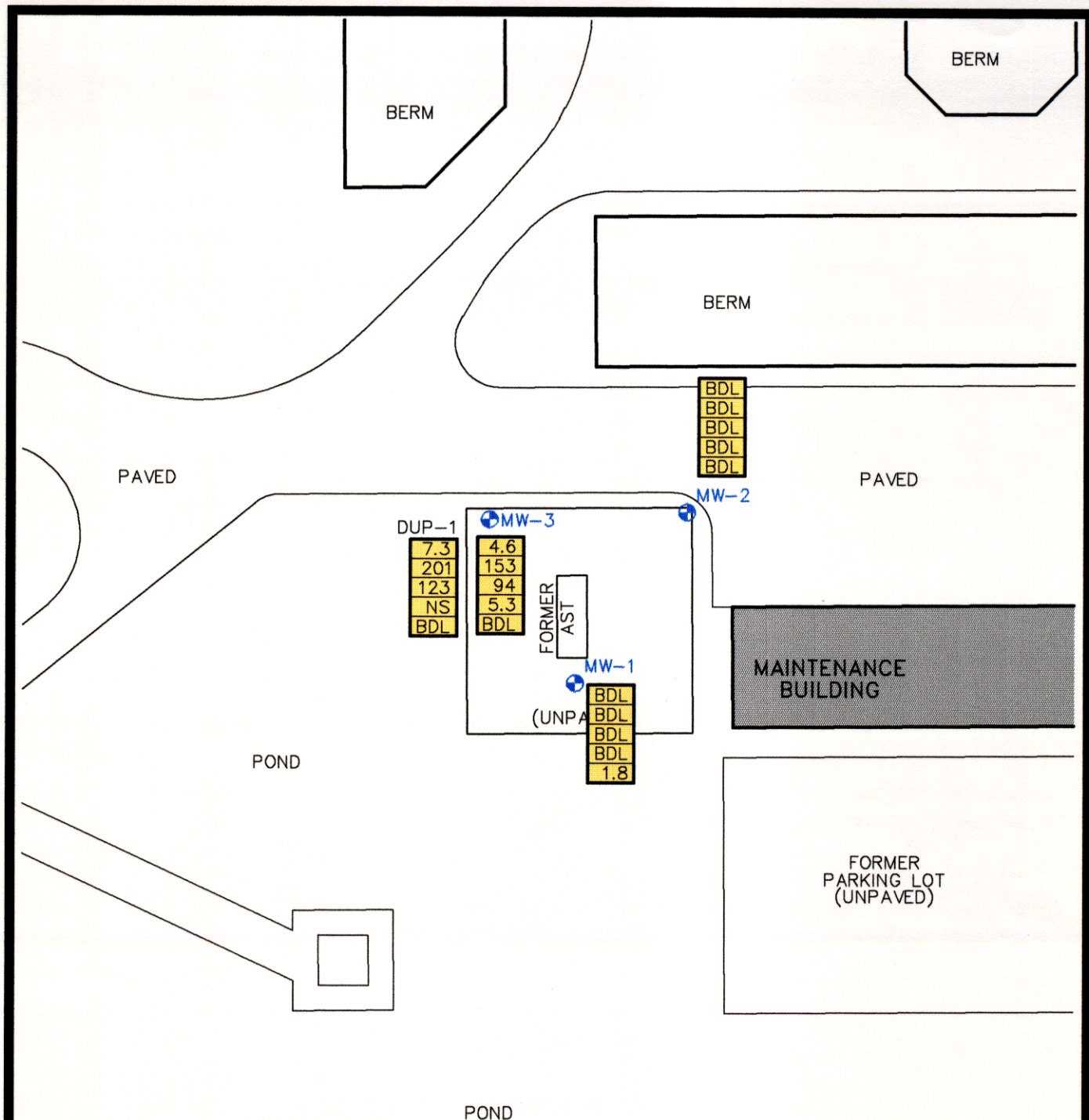
NAS KEY WEST
HAMACA HAWK MISSILE SITE
CONTAMINATION ASSESSMENT

HYDRAULIC GRADIENT
(6/4/97) MEAN LOW TIDE

BBL

BLASLAND, BOUCK & LEE, INC.
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FIGURE
2-3



LEGEND

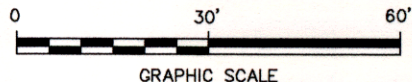
MW-1 MONITORING WELL

4.6	TOTAL VOLATILE ORGANIC AROMATICS (µg/L)
153	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS (µg/L)
94	TOTAL NAPHTHALENES (µg/L)
5.3	TOTAL RECOVERABLE PETROLEUM HYDROCARBONS (µg/L)
1.8	cis-1,2-DICHLOROETHYLENE (µg/L)

(µg/L) = MICROGRAMS PER LITER

BDL = BELOW DETECTION LIMITS

NS = NO SAMPLE



NAS KEY WEST HAMACA HAWK MISSILE SITE CONTAMINATION ASSESSMENT

SUMMARY OF PETROLEUM HYDROCARBONS IN GROUNDWATER

BBL

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FIGURE
2-4

Tables

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

TABLE 2-1

**Hamaca Hawk Missile Site
Naval Air Station Key West, Florida**

MONITORING WELL COMPLETION SUMMARY

Well	Date Installed	Total Well Depth (ft BLS)	Well Casing Length (ft)	Screen Length (ft)	Screen Slot Size (in)	Sand Pack	Screen Interval (ft BLS)	Type of Completion
MW-1	6/2/97	12	2	10	0.010	30/45	2-12	flush
MW-2	6/2/97	12	2	10	0.010	30/45	2-12	flush
MW-3	6/2/97	12	2	10	0.010	30/45	2-12	flush

Notes: All monitoring wells are 2 inches in diameter and constructed of Schedule 40 PVC.

BLS = Below land surface

in = Inches

ft = Feet

Source: Blasland, Bouck & Lee, Inc., 1997.

TABLE 2-2

**Hamaca Hawk Missile Site
Naval Air Station Key West, Florida**

TIDAL INFLUENCE ON WATER LEVELS

Well	TOC Elevation (ft MSL)	Depth to Water at 1030 6/4/97	Depth to Water at 1330 6/4/97	Depth to Water at 0850 6/5/97
MW-1	3.58	0.25	0.33	0.26
MW-2	4.12	0.30	0.36	0.31
MW-3	3.57	0.26	0.31	0.28

Well	Water Table Elevation at 1030 6/4/97	Water Table Elevation at 1330 6/4/97	Water Table Elevation at 0850 6/5/97
MW-1	3.33	3.25	3.32
MW-2	3.82	3.76	3.81
MW-3	3.31	3.26	3.29

Notes: All depth to water measurements taken from top of casing in feet.

Ft MSL = Feet Mean Sea Level

TOC = Top of Casing

Benchmark assumed 5.00 ft MSL.

Tides for Key West: 6/4/97: Low - 0015: 1517; High - 0838: 2204

6/5/97: Low - 0237: 1601; High - 0918: 2246

Source: Blasland, Bouck & Lee, Inc., 1997.

TABLE 2-3

**Hamaca Hawk Missile Site
Naval Air Station Key West, Florida**

SUMMARY OF ORGANIC VAPOR ANALYSIS

Boring/Well	Date Sampled	Sample Depth (ft BLS)	Total Organic Vapors (ppm)	Total Methane Vapors (ppm)	Corrected Petroleum HC Vapors (ppm)	Notes
S-1/MW-1	6/2/97	1	0	-	0	Saturated
		2	0	-	0	
		3	0	-	0	
		4	0	-	0	
		5	0	-	0	
S-2/MW-2	6/2/97	1.5	4	-	4	HC odor
		3	30	8	22	HC odor
		5	30	9.5	20.5	HC odor/Saturated
S-3/MW-3	6/2/97	1.5	2.5	-	2.5	HC odor
		3	75	5	70	HC odor
		5	45	5	40	HC odor/Saturated
S-4	6/2/97	1.5	0	-	0	Saturated
		2.5	0	-	0	
		4	17	9.5	7.5	
S-5	6/2/97	1.5	0	-	0	Saturated
		2.5	0	-	0	
		4	0	-	0	
S-6	6/2/97	1.5	0	-	0	Moist
		3	0	-	0	
S-7	6/2/97	1.5	0	-	0	Saturated/HC odor
		2.5	0	-	0	
		4	34	-	34	
S-8	6/2/97	1.5	2	-	2	Saturated
		3	27	4	23	
		4	31.5	2	29.5	
S-9	6/2/97	1.5	1	-	1	Saturated
		3	2.5	-	2.5	
		4	2	-	2	
S-10	6/2/97	1.5	0	-	0	Saturated
		3	0	-	0	
		4	8	0	8	

All samples were analyzed with an organic vapor analyzer (OVA) equipped with a flame-ionization detector.

Samples noted as saturated were collected at or below the water table and used for screening purposes only.

- = Reading not taken

BLS = Below land surface

HC = Hydrocarbon

ft = Feet

ppm = Parts per million

Source: Blasland, Bouck & Lee, Inc., 1997.

TABLE 2-4

**Hamaca Hawk Missile Site
Naval Air Station Key West, Florida**

FINAL WATER QUALITY FIELD MEASUREMENTS

Well	pH	Temp °C	Specific Conductance (umhos/cm)
Sample Date: June 4, 1997			
MW-1	6.15	26.38	295
MW-2	6.26	27.75	1,022
MW-3	6.30	27.48	1,135

Notes: umhos/cm = Micromhos per centimeter

°C = Degrees Celsius

Source: Blasland, Bouck & Lee, Inc., 1997.

TABLE 2-5

**Hamaca Hawk Missile Site
Naval Air Station Key West, Florida**

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS

Sample ID	Benzene	Total VOAs ¹	Total Naphthalenes ²	Total PAHs ³	TRPH ⁴	cis-1,2-DCE ⁵
Sample Date: June 4, 1997						
MW-1	<1.0	BDL	BDL	<1.0	<1.0	1.8
MW-2	<1.0	BDL	BDL	<1.0	<1.0	<1.0
MW-3	<1.0	4.6	94	153	5.3	<1.0
Dup-1 (MW-3)	<1.0	7.3	123	201	NS	<1.0
62-770 Target Level	1	50	100	Detection Limit 10 max.	5	70

All results in micrograms per liter.

<1.0 = Below detection limit specified.

BDL = Analyte is below detection limit (detection limits vary).

NS = No sample.

Shading indicates a parameter above target level.

¹ Total Volatile Organic Aromatics = sum of benzene, toluene, ethylbenzene, and xylenes.

² Total Naphthalenes = Sum of naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene.

³ Total PAHs = Sum of Polynuclear Aromatic Hydrocarbons.

⁴ TRPH = Total Recoverable Petroleum Hydrocarbons.

⁵ cis-1,2-DCE = cis-1,2-dichloroethylene

Sources: Blasland, Bouck & Lee, Inc., 1997; Savannah Laboratories and Environmental Services, Inc., 1997.

Appendix A

BLASLAND, BOUCK & LEE, INC.
engineers & scientists



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blake Stone Road • Tallahassee, Florida 32399-2400

DEP Form #	17-751 (2003/0)
Form Title	Closure Assessment Form
Revision Date	December 10, 1995
DEP Approval No.	17-751-01-001

Closure Assessment Form

Owners of storage tank systems that are replacing, removing or closing in place storage tanks shall use this form to demonstrate that a storage system closure assessment was performed in accordance with Rule 17-761 or 17-762, Florida Administrative Code. Eligible Early Detection Incentive (EDI) and Reimbursement Program sites do not have to perform a closure assessment.

Please Print or Type
Complete All Applicable Blanks

- Date: 17 June 1996
- DER Facility ID Number: (Applied For)
- County: Monroe
- Facility Name: U.S. Navy
- Facility Owner: Commanding Officer, NAS Key West
- Facility Address: Hamaca (H01) Hawk Missile Site
- Mailing Address: Code 1883 Public Works Dept. P.O. Box 9007 Key West, FL 33040
- Telephone Number: (305) 293-2881
- Facility Operator: Mr. Jim Simmen
- Are the Storage Tank(s): (Circle one or both) ☒ A. Aboveground or ☐ B. Underground
- Type of Product(s) Stored: Diesel
- Were the Tank(s): (Circle one) A. Replaced ☒ B. Removed C. Closed In Place D. Upgraded (aboveground tanks only)
- Number of Tanks Closed: One (1)
- Age of Tanks: _____

Facility Assessment Information

Yes No Not Applicable

<input type="checkbox"/>	<input checked="" type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	

1. Is the facility participating in the Florida Petroleum Liability Insurance and Restoration Program (FPLIRP)?

2. Was a Discharge Reporting Form submitted to the Department?

If yes, When: _____ Where: _____

<input checked="" type="checkbox"/>	<input type="checkbox"/>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

3. Is the depth to ground water less than 20 feet?

4. Are monitoring wells present around the storage system?

If yes, specify type: ☐ Water monitoring ☐ Vapor monitoring

<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

5. Is there free product present in the monitoring wells or within the excavation?

6. Were the petroleum hydrocarbon vapor levels in the soils greater than 500 parts per million for gasoline?

Specify sample type: ☐ Vapor Monitoring wells ☐ Soil sample(s)

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Were the petroleum hydrocarbon vapor levels in the soils greater than 50 parts per million for diesel/kerosene?

Specify sample type: ☐ Vapor Monitoring wells ☒ Soil sample(s)

<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Were the analytical laboratory results of the ground water sample(s) greater than the allowable state target levels? (See target levels on reverse side of this form and supply laboratory data sheets)

9. If a used oil storage system, did a visual inspection detect any discolored soil indicating a release?

<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Are any potable wells located within 1/4 of a mile radius of the facility?

11. Is there a surface water body within 1/4 mile radius of the site? If yes, Indicate distance: _____

Navy Public Works Center Environmental Laboratory

Bldg. 3887, Code 920
NAS Pensacola, FL 32508 - 6500
Phone (904) 452-4728/3642
SN 922-4728/3642

Client: Key West NAS
Address: Key West, FL
Phone: DSN 483-2881
Contact: Paul Semmes

Analytical Report 602 Volatiles by Method 8260

Lab Report Number: 61816
Sample Date: 04 May 96
Received Date: 07 May 96
Sample Site: Key West NAS
Job Order No.: 1024019

LAB Sample ID#	1-	61816
Sample Name / Location	Hamaca 01	
Collector's Name	R. Davis	
Date & Time Collected	05/04/96 @ 0740	
Sample Type (composite or grab)	Grab	
Analyst	J. Moore	
Date of Extraction / Initials	05/10/96 JM	
Date of Analysis	05/10/96	
Sample Matrix	Groundwater	
Dilution	X 1	
COMPOUND NAME	1- 61816	Det. Limit
Benzene	BDL	UG/L 1
Chlorobenzene	BDL	UG/L 1
1,2-Dichlorobenzene	BDL	UG/L 1
1,3-Dichlorobenzene	BDL	UG/L 1
1,4-Dichlorobenzene	BDL	UG/L 1
Ethylbenzene	9	UG/L 1
Toluene	BDL	UG/L 1
Xylenes (Total)	BDL	UG/L 1
Methyl-tert-butyl ether (MTBE) *	BDL	UG/L 1
Total VOA	8	UG/L

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	
1,2-Dichloroethane-d4	75-133	108
Toluene-d8	86-119	111
Bromofluorobenzene	85-116	111

COMMENTS :

BDL = Below detection limit. UG/L = Microgram per liter. * = FL HRS certification pending

Approved by :

Jim Taylor J. Dees

Date:

5/12/96

Navy Public Works Center Environmental Laboratory

Bldg. 3887, Code 920
AS Pensacola, FL 32508 - 6500
Phone (904) 452-4728/3642
DSN 922-4728/3642

Client: Key West NAS
Address Key West, FL
Phone DSN 483-2881
Contact Paul Semmes

Analytical Report

610 PAH's by Method 8270

Lab Report Number: 61816
Sample Date: 04 May 96
Received Date: 07 May 96
Sample Site: Key West NAS
Job Order No.: 1024019

LAB Sample ID#	1- 61816
Sample Name / Location	Hammock 91
Collector's Name	R. Davis
Date & Time Collected	05/04/96 @ 0740
Sample Type (composite or grab)	Grab
Analyst	J. Moore
Date of Extraction / Initials	05/09/96 JJ
Date of Analysis	05/21/96
Sample Matrix	Groundwater
Dilution	X 1

COMPOUND NAME	1- 61816	units	Det. Limit	61816 Re-extract	units	Det. Limit
Acenaphthene ✓	3 J	UG/L	5	7	UG/L	5
Acenaphthylene ✓	BDL	UG/L	5	BDL	UG/L	5
Anthracene ✓	BDL	UG/L	2	BDL	UG/L	2
Benzo(a)anthracene ✓	BDL	UG/L	3	BDL	UG/L	3
Benzo(a)pyrene ✓	BDL	UG/L	2	BDL	UG/L	2
Benzo(b)fluoranthene ✓	BDL	UG/L	4	BDL	UG/L	4
Benzo(g,h,i)perylene ✓	BDL	UG/L	3	BDL	UG/L	3
Benzo(k)fluoranthene ✓	BDL	UG/L	4	BDL	UG/L	4
Chrysene ✓	BDL	UG/L	3	BDL	UG/L	3
Dibenz(a,h)anthracene ✓	BDL	UG/L	3	BDL	UG/L	3
Fluoranthene ✓	BDL	UG/L	2	BDL	UG/L	2
Fluorene ✓	4	UG/L	4	11	UG/L	4
Indeno(1,2,3-cd)pyrene ✓	BDL	UG/L	2	BDL	UG/L	2
1-Methylnaphthalene ✓	42	UG/L	7	120	UG/L	7
2-Methylnaphthalene ✓	4 J	UG/L	5	12	UG/L	5
Naphthalene ✓	2 J	UG/L	7	3 J	UG/L	7
Phenanthrene ✓	4	UG/L	3	12	UG/L	3
Pyrene ✓	BDL	UG/L	3	BDL	UG/L	3

SURROGATE SPIKE RECOVERIES

	Acceptance Limits	61816	61816 RE-EXTRACT
Nitrobenzene- d5	35-114	55	76
2-Fluorobiphenyl	43-116	28 **	79
Terphenyl- d14	33-141	17 **	77

COMMENTS :

This sample was extracted on 05/09/96 and analyzed on 05/22/96. Surrogate recoveries on the initial extraction were below acceptance limits. The sample was re-extracted and analyzed on 05/24/96. The results were within limits, but the re-extraction data had exceeded holding times.

BDL = Below detection limit. UG/L = Microgram per liter.
J = Compound was detected at a concentration below reporting limits.

** = Surrogate recovery outside of acceptance limits

Approved By:

Jim Taylor for Jerry Deo

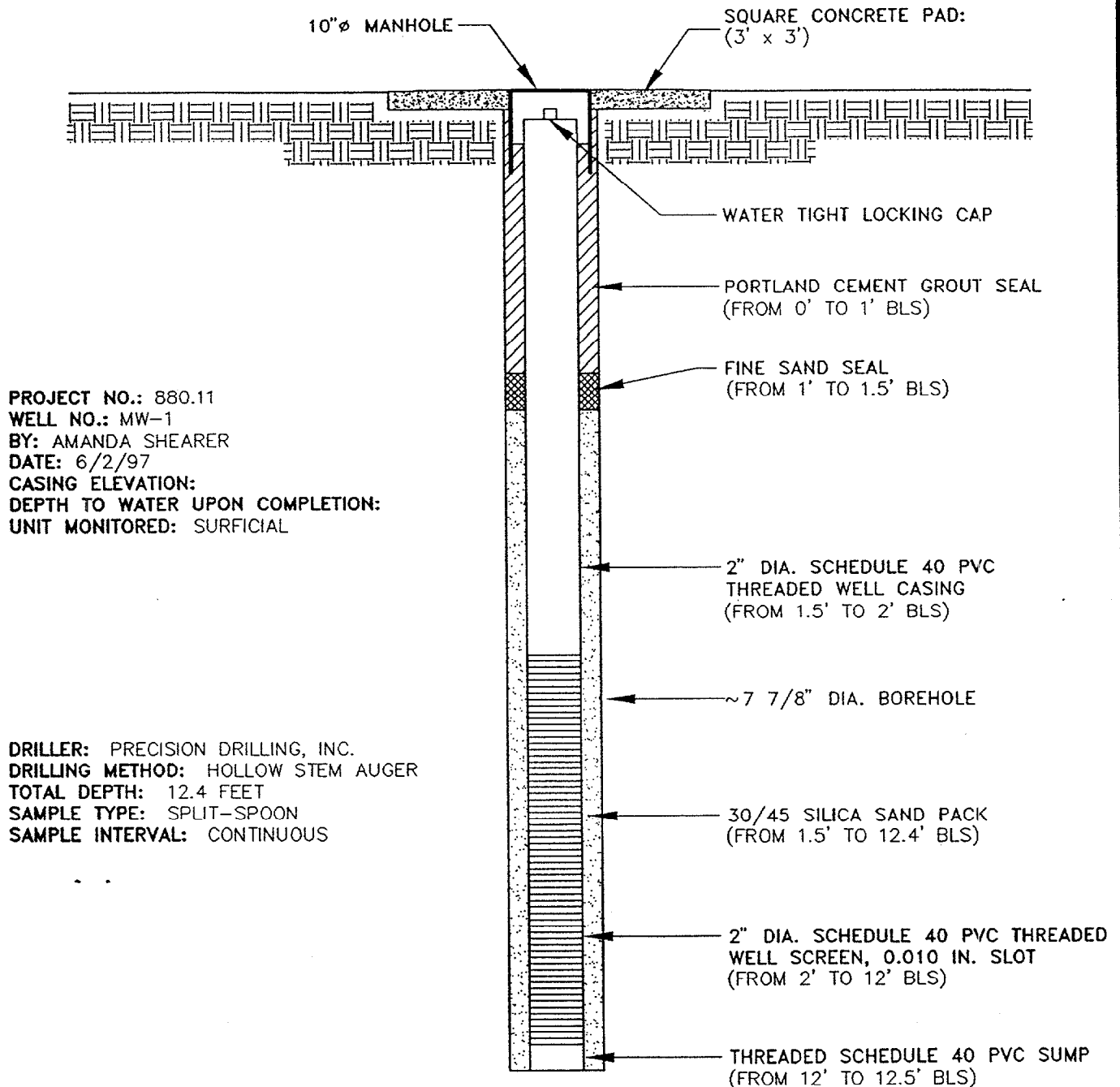
Date:

5/28/96

Appendix B

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

SHALLOW MONITORING WELL



(DRAWING NOT TO SCALE)

NAS KEY WEST
HAMACA HAWK MISSILE SITE
CONTAMINATION ASSESSMENT

WELL
CONSTRUCTION DETAIL

BBL

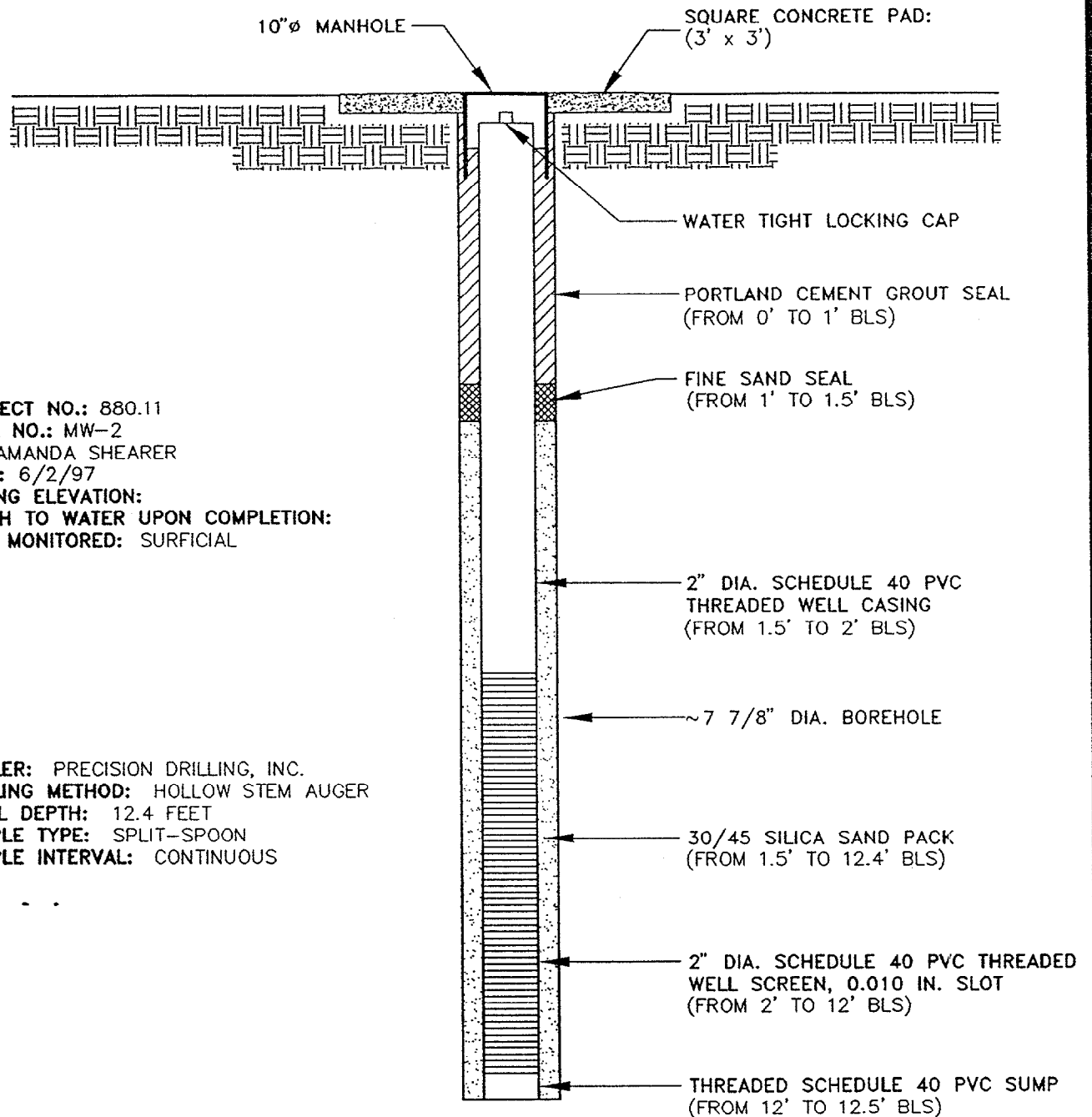
BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
B-1

SHALLOW MONITORING WELL

PROJECT NO.: 880.11
WELL NO.: MW-2
BY: AMANDA SHEARER
DATE: 6/2/97
CASING ELEVATION:
DEPTH TO WATER UPON COMPLETION:
UNIT MONITORED: SURFICIAL

DRILLER: PRECISION DRILLING, INC.
DRILLING METHOD: HOLLOW STEM AUGER
TOTAL DEPTH: 12.4 FEET
SAMPLE TYPE: SPLIT-SPOON
SAMPLE INTERVAL: CONTINUOUS



(DRAWING NOT TO SCALE)

NAS KEY WEST
HAMACA HAWK MISSILE SITE
CONTAMINATION ASSESSMENT

WELL
CONSTRUCTION DETAIL

BBL

BLASLAND, BOUCK & LEE, INC.
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FIGURE
B-2

SAMPLE/CORE LOG

880. 11

Page _____ of _____

Site Location Harvey Hawk Missile Site

Drilling Started 6/2/47

Drilling Completed 6/2/97

Total Depth Drilled 12 feet

Hole Diameter _____ inches

Type of Sample/
Coring Device HA Hollow
Stem

Length and Diameter
of Coring Device

Sampling Interval _____ feet

Land-Surface Elev. _____ feet

☐ Surveyed☐ Estimated

Datum _____

Drilling Fluid Used N/A

Drilling Method Hollow stem

Drilling Contractor Precision Drilling Inc.

Robert
Driller Miller

Helper Son/Willie

Prepared By Precious Dull

Hammer

Hammer

Weight _____ Drop _____ inches

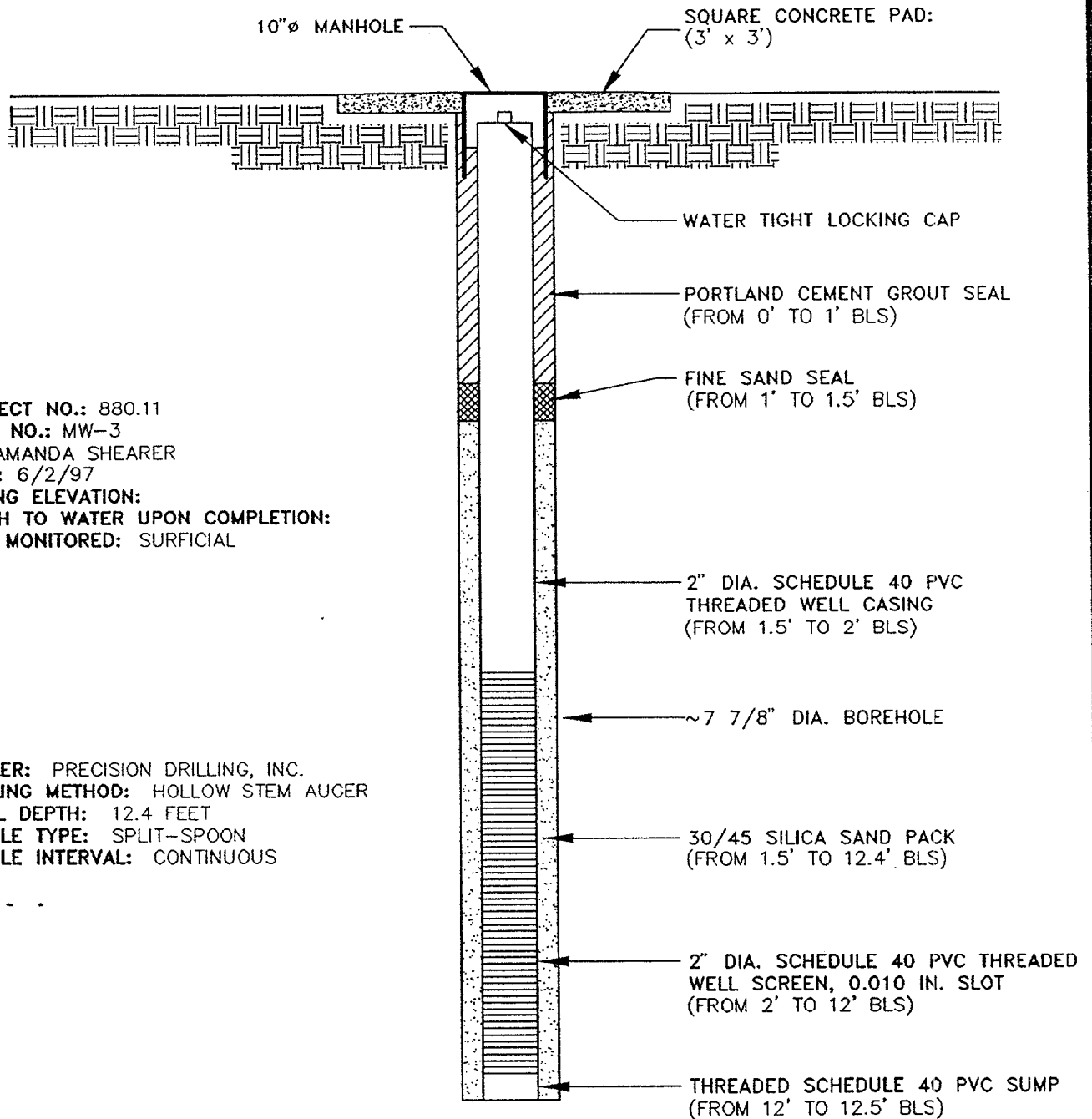
**Core
Recovery
(1994)**

Time/Hydraulic
Pressure or
Strokes per 6
inches

Sample/Core Description

[illegible]

SHALLOW MONITORING WELL



PROJECT NO.: 880.11
WELL NO.: MW-3
BY: AMANDA SHEARER
DATE: 6/2/97
CASING ELEVATION:
DEPTH TO WATER UPON COMPLETION:
UNIT MONITORED: SURFICIAL

DRILLER: PRECISION DRILLING, INC.
DRILLING METHOD: HOLLOW STEM AUGER
TOTAL DEPTH: 12.4 FEET
SAMPLE TYPE: SPLIT-SPOON
SAMPLE INTERVAL: CONTINUOUS

(DRAWING NOT TO SCALE)

NAS KEY WEST
HAMACA HAWK MISSILE SITE
CONTAMINATION ASSESSMENT

WELL
CONSTRUCTION DETAIL

BBL

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

FIGURE
B-3

Appendix C

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

SL SAVANNAH LABORATORIES & ENVIRONMENTAL SERVICES, INC.

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JUN 30 1997

LOG NO: D7-51176
Received: 06 JUN 97
Reported: 23 JUN 97

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Blasland, Bouck, & Lee
3350 Buschwood Park Dr., Suite 100 TAMPA
Tampa, FL 33618

BLASLAND, BOUCK & LEE

Project: #880.11 (Hamara Hawk)
Sampled By: DP/AS
Code: 153470623

REPORT OF RESULTS

Page 1

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED	
51176-1	Trip	06-04-97	
51176-2	Equip-1	06-04-97	
PARAMETER		51176-1	51176-2
Purgeable Aromatics (602)			
Benzene, ug/l		<1.0	<1.0
Chlorobenzene, ug/l		<1.0	<1.0
1,2-Dichlorobenzene, ug/l		<1.0	<1.0
1,3-Dichlorobenzene, ug/l		<1.0	<1.0
1,4-Dichlorobenzene, ug/l		<1.0	<1.0
Ethylbenzene, ug/l		<1.0	<1.0
Toluene, ug/l		<1.0	<1.0
Xylenes, ug/l		<2.0	<2.0
Methyl tert-butyl ether (MTBE), ug/l		<10	<10
Date Analyzed		06.06.97	06.06.97
Method Number		EPA 602	EPA 602
Dilution factor		1	1

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Project: #880.11 (Hamara Hawk)
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Page 2

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED		
51176-3	MW-1	06-04-97/1055		
51176-4	MW-2	06-04-97/1110		
51176-5	MW-3	06-04-97/1130		
PARAMETER		51176-3	51176-4	51176-5
Purgeables (601/602)				
Bromodichloromethane, ug/l		<1.0	<1.0	<1.0
Bromoform, ug/l		<5.0	<5.0	<5.0
Bromomethane, ug/l		<1.0	<1.0	<1.0
Carbon tetrachloride, ug/l		<1.0	<1.0	<1.0
Chlorobenzene, ug/l		<1.0	<1.0	<1.0
Chloroethane, ug/l		<1.0	<1.0	<1.0
2-Chloroethylvinyl Ether, ug/l		<10	<10	<10
Chloroform, ug/l		<1.0	<1.0	<1.0
Chloromethane, ug/l		<1.0	<1.0	<1.0
Dibromochloromethane, ug/l		<1.0	<1.0	<1.0
1,2-Dichlorobenzene, ug/l		<1.0	<1.0	<1.0
1,3-Dichlorobenzene, ug/l		<1.0	<1.0	<1.0
1,4-Dichlorobenzene, ug/l		<1.0	<1.0	<1.0
Dichlorodifluoromethane, ug/l		<1.0	<1.0	<1.0
1,1-Dichloroethane, ug/l		<1.0	<1.0	<1.0
1,2-Dichloroethane, ug/l		<1.0	<1.0	<1.0
1,1-Dichloroethene, ug/l		<1.0	<1.0	<1.0
cis-1,2-Dichloroethylene, ug/l		1.8	<1.0	<1.0
trans-1,2-Dichloroethylene, ug/l		<1.0	<1.0	<1.0
1,2-Dichloropropane, ug/l		<1.0	<1.0	<1.0
cis-1,3-Dichloropropene, ug/l		<1.0	<1.0	<1.0
trans-1,3-Dichloropropene, ug/l		<1.0	<1.0	<1.0
Methylene chloride, ug/l		<5.0	<5.0	<5.0

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Project: #880.11 (Hamara Hawk)
Sampled By: DP/AS
Code: 154470623
Page 3

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED		
51176-3	MW-1	06-04-97/1055		
51176-4	MW-2	06-04-97/1110		
51176-5	MW-3	06-04-97/1130		
PARAMETER	51176-3	51176-4	51176-5	
1,1,2,2-Tetrachloroethane, ug/l	<1.0	<1.0	<1.0	
Tetrachloroethene, ug/l	<1.0	<1.0	<1.0	
1,1,1-Trichloroethane, ug/l	<1.0	<1.0	<1.0	
1,1,2-Trichloroethane, ug/l	<1.0	<1.0	<1.0	
Trichloroethene, ug/l	<1.0	<1.0	<1.0	
Trichlorofluoromethane, ug/l	<1.0	<1.0	<1.0	
Vinyl chloride, ug/l	<1.0	<1.0	<1.0	
Benzene, ug/l	<1.0	<1.0	<1.0	
Ethylbenzene, ug/l	<1.0	<1.0	<1.0	
Toluene, ug/l	<1.0	<1.0	<1.0	
Xylenes, ug/l	<2.0	<2.0	4.6	
Methyl-tert-butyl ether (MTBE), ug/l	<10	<10	<10	
Date Analyzed	06.06.97	06.06.97	06.09.97	
Method Number	601/602	601/602	601/602	
Dilution factor	1	1	1	

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Code: 154470623
Page 4

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LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED		
51176-3	MW-1	06-04-97/1055		
51176-4	MW-2	06-04-97/1110		
51176-5	MW-3	06-04-97/1130		
PARAMETER		51176-3	51176-4	51176-5
Polynuclear Aromatic Hydrocarbons (EPA 610)				
Acenaphthene, ug/l		<10	<10	35
Acenaphthylene, ug/l		<10	<10	70
Anthracene, ug/l		<10	<10	<10
Benzo(a)anthracene, ug/l		<4.0	<4.0	<4.0
Benzo(a)pyrene, ug/l		<4.0	<4.0	<4.0
Benzo(b)fluoranthene, ug/l		<4.0	<4.0	<4.0
Benzo(g,h,i)perylene, ug/l		<10	<10	<10
Benzo(k)fluoranthene, ug/l		<5.0	<5.0	<5.0
Chrysene, ug/l		<5.0	<5.0	<5.0
Dibenzo(a,h)anthracene, ug/l		<5.0	<5.0	<5.0
Fluoranthene, ug/l		<10	<10	<10
Fluorene, ug/l		<10	<10	33
Indeno(1,2,3-cd)pyrene, ug/l		<5.0	<5.0	<5.0
Naphthalene, ug/l		<5.0	<5.0	12
Phenanthrene, ug/l		<10	<10	15
Pyrene, ug/l		<10	<10	<10
2-Methylnaphthalene, ug/l		<10	<10	11
1-Methylnaphthalene, ug/l		<10	<10	71
Date Extracted		06.09.97	06.09.97	06.09.97
Date Analyzed		06.11.97	06.11.97	06.11.97
Method Number		EPA 610	EPA 610	EPA 610
Dilution factor		1	1	1

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Sampled By: DP/AS
Code: 154470623
Page 5

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED		
51176-3	MW-1	06-04-97/1055		
51176-4	MW-2	06-04-97/1110		
51176-5	MW-3	06-04-97/1130		
PARAMETER	51176-3	51176-4	51176-5	
Petroleum Hydrocarbons				
Petroleum Hydrocarbons, mg/l	<1.0	<1.0	5.3	
Date Extracted	06.11.97	06.11.97	06.11.97	
Date Analyzed	06.12.97	06.12.97	06.12.97	
Method Number	EPA 418.1	EPA 418.1	EPA 418.1	
Ethylene Dibromide (504)				
1,2-Dibromoethane (EDB) , ug/l	<0.020	<0.020	<0.020	
Date Analyzed	06.13.97	06.13.97	06.13.97	
Method Number	EPA 504	EPA 504	EPA 504	
Lead (7421)				
Lead, mg/l	<0.0050	<0.0050	<0.0050	
Date Analyzed	06.10.97	06.10.97	06.10.97	
Method Number	EPA 7421	EPA 7421	EPA 7421	

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Sampled By: DP/AS
Code: 154470623
Page 6

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
51176-6	Dup-1	06-04-97
PARAMETER	51176-6	
Purgeables (601/602)		
Bromodichloromethane, ug/l		<1.0
Bromoform, ug/l		<5.0
Bromomethane, ug/l		<1.0
Carbon tetrachloride, ug/l		<1.0
Chlorobenzene, ug/l		<1.0
Chloroethane, ug/l		<1.0
2-Chloroethylvinyl Ether, ug/l		<10
Chloroform, ug/l		<1.0
Chloromethane, ug/l		<1.0
Dibromochloromethane, ug/l		<1.0
1,2-Dichlorobenzene, ug/l		<1.0
1,3-Dichlorobenzene, ug/l		<1.0
1,4-Dichlorobenzene, ug/l		<1.0
Dichlorodifluoromethane, ug/l		<1.0
1,1-Dichloroethane, ug/l		<1.0
1,2-Dichloroethane, ug/l		<1.0
1,1-Dichloroethene, ug/l		<1.0
cis-1,2-Dichloroethylene, ug/l		<1.0
trans-1,2-Dichloroethylene, ug/l		<1.0
1,2-Dichloropropane, ug/l		<1.0
cis-1,3-Dichloropropene, ug/l		<1.0
trans-1,3-Dichloropropene, ug/l		<1.0
Methylene chloride, ug/l		<5.0
1,1,2,2-Tetrachloroethane, ug/l		<1.0
Tetrachloroethene, ug/l		<1.0

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Project: #880.11 (Hamara Hawk)
Sampled By: DP/AS
Code: 154470623
Page 7

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
51176-6	Dup-1	06-04-97
PARAMETER	51176-6	
1,1,1-Trichloroethane, ug/l	<1.0	
1,1,2-Trichloroethane, ug/l	<1.0	
Trichloroethene, ug/l	<1.0	
Trichlorofluoromethane, ug/l	<1.0	
Vinyl chloride, ug/l	<1.0	
Benzene, ug/l	<1.0	
Ethylbenzene, ug/l	1.2	
Toluene, ug/l	<10	
Xylenes, ug/l	6.1	
Methyl-tert-butyl ether (MTBE), ug/l	<10	
Date Analyzed	06.10.97	
Method Number	601/602	
Dilution factor	1	

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Sampled By: DP/AS
Code: 154470623
Page 8

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
51176-6	Dup-1	06-04-97
PARAMETER	51176-6	
Polynuclear Aromatic Hydrocarbons (EPA 610)		
Acenaphthene, ug/l	51	
Acenaphthylene, ug/l	88	
Anthracene, ug/l	<10	
Benzo(a)anthracene, ug/l	<4.0	
Benzo(a)pyrene, ug/l	<4.0	
Benzo(b)fluoranthene, ug/l	<4.0	
Benzo(g,h,i)perylene, ug/l	<10	
Benzo(k)fluoranthene, ug/l	<5.0	
Chrysene, ug/l	<5.0	
Dibenzo(a,h)anthracene, ug/l	<5.0	
Fluoranthene, ug/l	<10	
Fluorene, ug/l	45	
Indeno(1,2,3-cd)pyrene, ug/l	<5.0	
Naphthalene, ug/l	16	
Phenanthrene, ug/l	17	
Pyrene, ug/l	<10	
2-Methylnaphthalene, ug/l	22	
1-Methylnaphthalene, ug/l	85	
Date Extracted	06.09.97	
Date Analyzed	06.11.97	
Method Number	EPA 610	
Dilution factor	1	
Ethylene Dibromide (504)		
1,2-Dibromoethane (EDB) , ug/l	<0.020	
Date Analyzed	06.13.97	
Method Number	EPA 504	

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Sampled By: DP/AS
Code: 154470623
Page 9

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE SAMPLED
51176-6	Dup-1	06-04-97
PARAMETER	51176-6	
Lead (7421)		
Lead, mg/l	<0.0050	
Date Analyzed	06.10.97	
Method Number	EPA 7421	

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Project: #880.11 (Hamara Hawk)
Sampled By: DP/AS
Code: 154470623
Page 10

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

51176-7 Lab Blank
51176-8 Accuracy - % Recovery (Mean)
51176-9 Precision - Relative % Difference
51176-10 Detection Limit

PARAMETER	51176-7	51176-8	51176-9	51176-10
Purgeable Aromatics (602)				
Benzene, ug/l	<1.0	104 %	3.8 %	1.0
Chlorobenzene, ug/l	<1.0	102 %	3.0 %	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	98 %	1.0 %	1.0
Xylenes, ug/l	<2.0	---	---	2.0
Methyl tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	06.06.97	---	---	---
Method Number	EPA 602	---	---	---

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Page 11

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

51176-7 Lab Blank
51176-8 Accuracy - % Recovery (Mean)
51176-9 Precision - Relative % Difference
51176-10 Detection Limit

PARAMETER	51176-7	51176-8	51176-9	51176-10
Purgeables (601/602)				
Bromodichloromethane, ug/l	<1.0	---	---	1.0
Bromoform, ug/l	<5.0	---	---	5.0
Bromomethane, ug/l	<1.0	---	---	1.0
Carbon tetrachloride, ug/l	<1.0	---	---	1.0
Chlorobenzene, ug/l	<1.0	102 %	3.0 %	1.0
Chloroethane, ug/l	<1.0	---	---	1.0
2-Chloroethylvinyl Ether, ug/l	<10	---	---	10
Chloroform, ug/l	<1.0	---	---	1.0
Chloromethane, ug/l	<1.0	---	---	1.0
Dibromochloromethane, ug/l	<1.0	---	---	1.0
1,2-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,3-Dichlorobenzene, ug/l	<1.0	---	---	1.0
1,4-Dichlorobenzene, ug/l	<1.0	---	---	1.0
Dichlorodifluoromethane, ug/l	<1.0	---	---	1.0
1,1-Dichloroethane, ug/l	<1.0	119 %	5.0 %	1.0
1,2-Dichloroethane, ug/l	<1.0	---	---	1.0
1,1-Dichloroethene, ug/l	<1.0	---	---	1.0
cis-1,2-Dichloroethylene, ug/l	<1.0	---	---	1.0
trans-1,2-Dichloroethylene, ug/l	<1.0	---	---	1.0
1,2-Dichloropropane, ug/l	<1.0	---	---	1.0
cis-1,3-Dichloropropene, ug/l	<1.0	---	---	1.0
trans-1,3-Dichloropropene, ug/l	<1.0	---	---	1.0

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Page 12

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

51176-7 Lab Blank
51176-8 Accuracy - % Recovery (Mean)
51176-9 Precision - Relative % Difference
51176-10 Detection Limit

PARAMETER	51176-7	51176-8	51176-9	51176-10
Methylene chloride, ug/l	<5.0	---	---	5.0
1,1,2,2-Tetrachloroethane, ug/l	<1.0	---	---	1.0
Tetrachloroethene, ug/l	<1.0	---	---	1.0
1,1,1-Trichloroethane, ug/l	<1.0	---	---	1.0
1,1,2-Trichloroethane, ug/l	<1.0	---	---	1.0
Trichloroethene, ug/l	<1.0	98 %	2.0 %	1.0
Trichlorofluoromethane, ug/l	<1.0	---	---	1.0
Vinyl chloride, ug/l	<1.0	---	---	1.0
Benzene, ug/l	<1.0	104 %	3.8 %	1.0
Ethylbenzene, ug/l	<1.0	---	---	1.0
Toluene, ug/l	<1.0	98 %	1.0 %	1.0
Xylenes, ug/l	<1.0	---	---	2.0
Methyl-tert-butyl ether (MTBE), ug/l	<10	---	---	10
Date Analyzed	06.06.97	---	---	---
Method Number	601/602	---	---	---

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Code: 154470623
Page 13

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

51176-7 Lab Blank
51176-8 Accuracy - % Recovery (Mean)
51176-9 Precision - Relative % Difference
51176-10 Detection Limit

PARAMETER	51176-7	51176-8	51176-9	51176-10
Polynuclear Aromatic Hydrocarbons (EPA 610)				
Acenaphthene, ug/l	<10	74 %*F75	6.8 %	10
Acenaphthylene, ug/l	<10	---	---	10
Anthracene, ug/l	<10	---	---	10
Benzo(a)anthracene, ug/l	<4.0	30 %*F75	30 %	4.0
Benzo(a)pyrene, ug/l	<4.0	---	---	4.0
Benzo(b)fluoranthene, ug/l	<4.0	---	---	4.0
Benzo(g,h,i)perylene, ug/l	<10	---	---	10
Benzo(k)fluoranthene, ug/l	<5.0	---	---	5.0
Chrysene, ug/l	<5.0	---	---	5.0
Dibenzo(a,h)anthracene, ug/l	<5.0	---	---	5.0
Fluoranthene, ug/l	<10	---	---	10
Fluorene, ug/l	<10	74 %*F75	6.7 %	10
Indeno(1,2,3-cd)pyrene, ug/l	<5.0	---	---	5.0
Naphthalene, ug/l	<5.0	64 %	19 %	5.0
Phenanthrene, ug/l	<10	---	---	10
Pyrene, ug/l	<10	74 %*F75	6.7 %	10
2-Methylnaphthalene, ug/l	<10	---	---	10
1-Methylnaphthalene, ug/l	<10	---	---	10
Date Extracted	06.09.97	---	---	---
Date Analyzed	06.10.97	---	---	---
Method Number	EPA 610	---	---	---

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Project: #880.11 (Hamara Hawk)
Sampled By: DP/AS
Code: 154470623
Page 14

REPORT OF RESULTS

LOG NO SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES

51176-7 Lab Blank
51176-8 Accuracy - % Recovery (Mean)
51176-9 Precision - Relative % Difference
51176-10 Detection Limit

PARAMETER	51176-7	51176-8	51176-9	51176-10
Petroleum Hydrocarbons				
Petroleum Hydrocarbons, mg/l	<1.0	92 %*F82	0 %	1.0
Date Extracted	06.11.97	---	---	---
Date Analyzed	06.12.97	---	---	---
Method Number	EPA 418.1	---	---	---
Ethylene Dibromide (504)				
1,2-Dibromoethane (EDB) , ug/l	<0.020	93 %*F75	6.4 %	0.020
Date Analyzed	06.12.97	---	---	---
Method Number	EPA 504	---	---	---
Lead (7421)				
Lead, mg/l	<0.0050	101 %	7.9 %	0.0050
Date Analyzed	06.10.97	---	---	---
Method Number	EPA 7421	---	---	---

Comprehensive Quality Assurance Plan #890142G.

SL Certifications: E86221/86371

Method References: EPA 40 CFR Part 136, EPA 600/4-79-020, EPA SW-846 and EPA 4-88-039.

*F75 = Matrix spike recoveries were outside advisory limits possibly due to matrix interference present in the sample; therefore, recovery of the laboratory control standard analyzed concurrently with the sample batch has been reported.

*F82 = Insufficient sample volume was available to perform a batch-specific matrix spike. However, an LCS analyzed with the sample batch met control criteria.


Paul Canevaro, Project Manager

Final Page Of Report

Laboratories in Savannah, GA • Tallahassee, FL • Tampa, FL • Deerfield Beach, FL • Mobile, AL • New Orleans, LA

SL

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